WESTERN GAS

December 1930

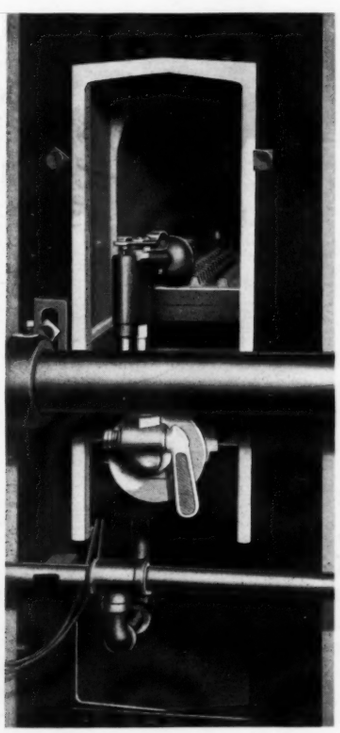
20 Cents the Copy

New

Thermo-Safety

PILOT

for Gas fired



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Milwaukee Gas Specialty Co.
Milwaukee, Wis.

DEC 19

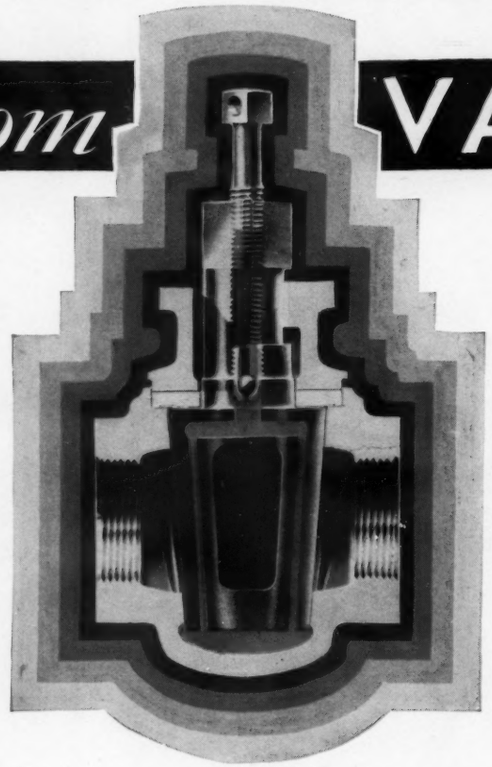
A MONTHLY JOURNAL DEVOTED TO THE WESTERN GAS & APPLIANCE INDUSTRIES

NORDSTROM, THE PERFECT APPLICATION of a PRINCIPLE

THE VALVE CONTROLS THE FLOW; THE SCREW CONTROLS THE VALVE

Nordstrom VALVES

Hydraulic lubrication insures effective manipulation



A turn of the screw pushes lubricant through

MERCO

High pressure lubrication prevents

valve leakage by application of the Nordstrom principle.

Nordstrom Valves prevent leaks and stay tight after long service. A force several times that of the line pressure is used to force viscous "Merco" lubricant into every pathway of leakage, thereby sealing the valve effectively from further leakage. The seat and plug surfaces are renewed completely by making use of the proper lubricants. At the same time pressure lubrication performs the other functions of a hydraulic jack when necessary to loosen the plug when stuck and so reduces the coefficient of friction on sliding metal surfaces held together under high pressure. Furthermore, Nordstrom Valves effectively combat corrosion and erosion when used as a stop in the pipe line. None of the vital parts are exposed to disintegrating forces of the fluid. We strongly recommend the use of genuine "Merco" lubricants. Ask for Catalog.

MERCO NORDSTROM VALVE COMPANY

SUBSIDIARY OF THE MERRILL COMPANY . . ENGINEERS

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Saginaw - Arthur C. Beckert, 112 Durand St.
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Tulsa - B.V. Emery & Company, 216 E. Brady Street

Factories in U. S. Oakland, Calif. and Belleville, N. J.
Canada - Peacock Bros., Ltd., Montreal, Toronto, Winnipeg, Vancouver. (Also Sydney, N.S.)
England - Audley Engineering Co., Ltd., Newport, Shropshire.
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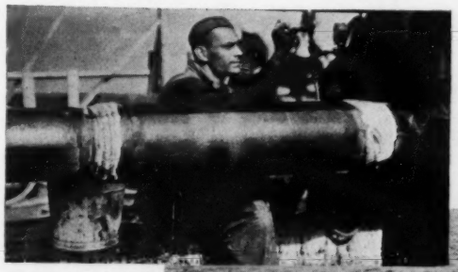
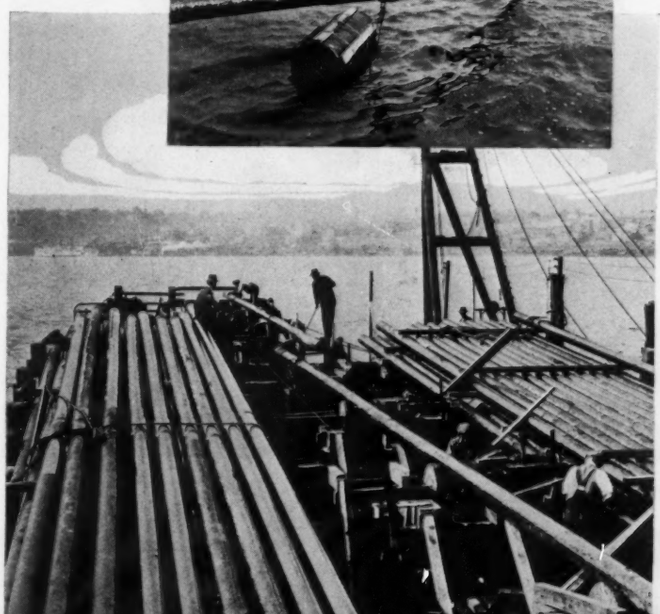
SEALED AGAINST LEAKS

Unusual methods and fast time

feature laying of high pressure Gas Line across Hudson River





INTERESTING and unusual construction methods were used in laying this high pressure gas line across the Hudson River between Beacon and Newburgh, New York, for the Central Hudson Gas & Electric Corporation.

The 8-inch extra strong pipe in 40-foot lengths was butt-welded together and handled in 80-foot units. The type of joint used for the line was specially designed and developed by T. A. Corby, Central Hudson Gas & Electric Corporation, and patent applied for. It consists of a butt-weld joint reinforced by a short sleeve of 9-inch standard pipe fitted over the joint and welded to the pipe at both ends. Each sleeve was tapped with a $\frac{1}{8}$-inch hole through which compressed nitrogen was admitted to the $\frac{5}{32}$-inch space between the pipe and sleeve at 350 lbs. pressure per square inch, as a test on each joint. This test was in addition to the regular test on the whole line.

Pontoons were used at 40 foot spacings to lessen strain on the pipe as it was lowered into the water. All pipe was given one coat of primer solution and one of enamel.

Despite storms, tides, rough water and heavy river traffic—6,520 feet of NATIONAL Pipe were laid in eleven days and seven hours! Another difficult river crossing added to the long list of conquests that have made NATIONAL—

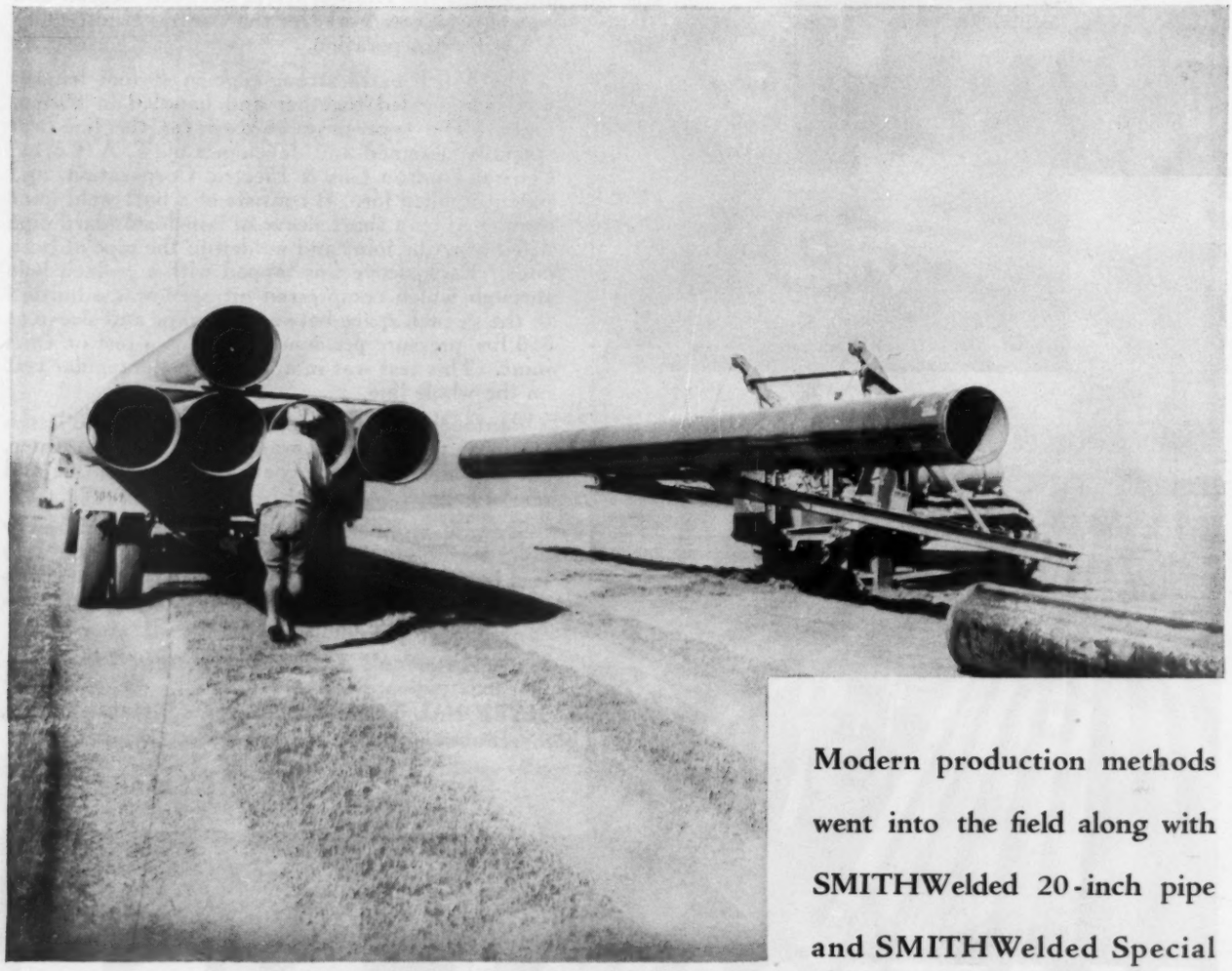
America's Standard Wrought Pipe

NATIONAL TUBE COMPANY · Pittsburgh, Pa.
Subsidiary of United States Steel Corporation

December, 1930, Volume VI, Number 12, WESTERN GAS is published by Western Business Papers, Inc., at 124 West Fourth Street, Los Angeles, California. Subscription price (in advance) 20 cents the copy; 2.00 per year; 3 years $5.00; $3.00 per year foreign. Entered as second class matter June 1, 1925, at the postoffice at Los Angeles, under the Act of March 3, 1879.

68 MILES

—*from Kettleman Hills*

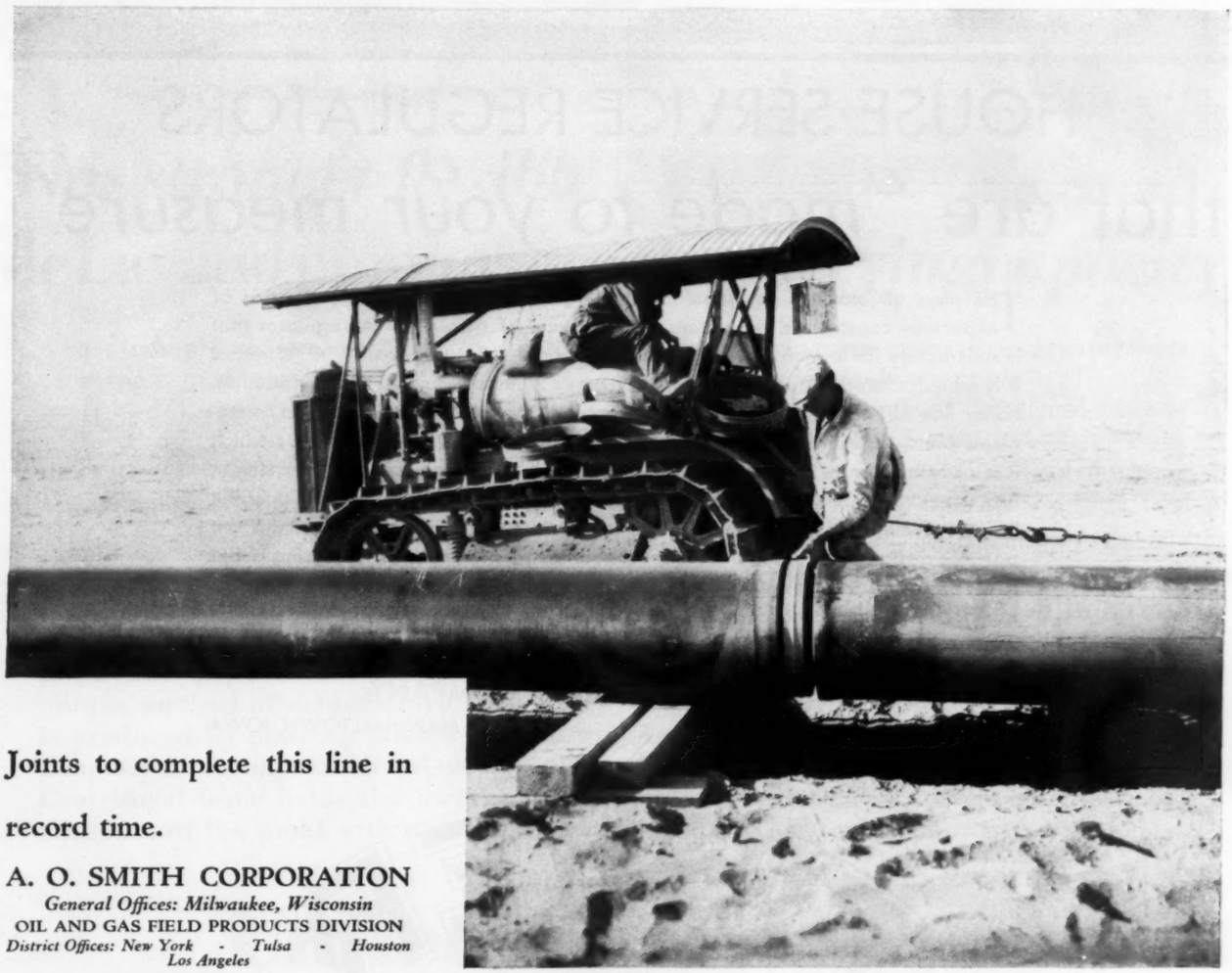


Modern production methods went into the field along with SMITHWelded 20-inch pipe and SMITHWelded Special

SMITH*WELDED*

IN 78 DAYS

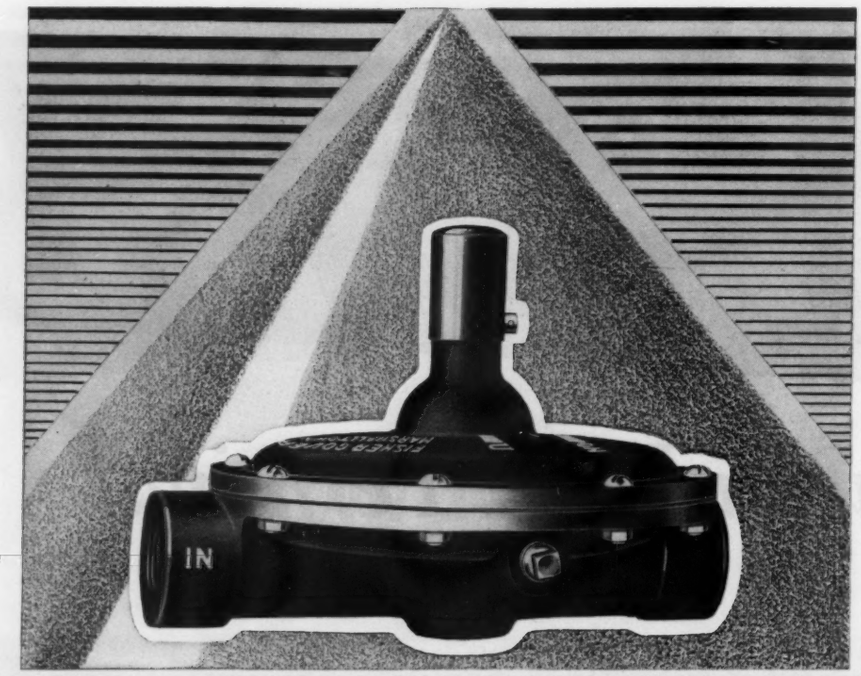
to Buena Vista Terminal



Joints to complete this line in record time.

A. O. SMITH CORPORATION
General Offices: Milwaukee, Wisconsin
OIL AND GAS FIELD PRODUCTS DIVISION
District Offices: New York - Tulsa - Houston Los Angeles

GAS LINE PIPE



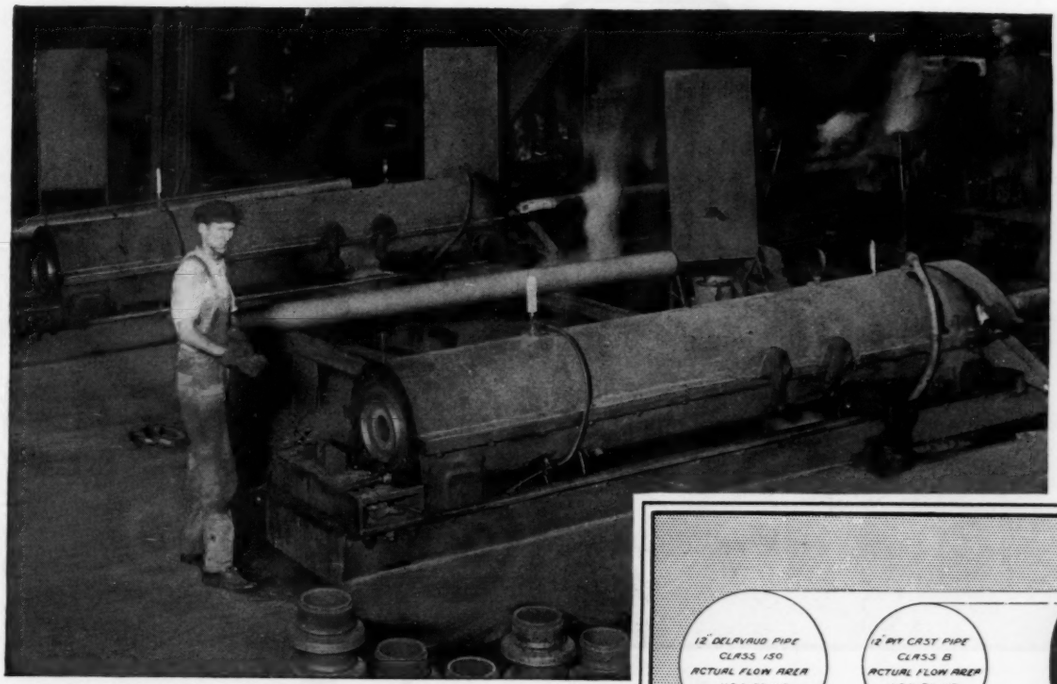
HOUSE SERVICE REGULATORS
that are *"made to your measure"*

THE days of "stocked gas regulators" are gone. Fisher now offers a series of especially constructed regulators for *each* kind af gas. ◈ ◈ A regulator that is satisfactory for manufactured gas is not correct for natural gas. ◈ ◈ Whether it is manufactured, natural, Butane air, or other types of gas you are distributing, Fisher has already solved your control problems. Fisher's established and recognized policy of building each control device for the particular service for which it is ordered is now at your complete command. Fisher's Research Department has developed special valve and diaphram materials to insure longest possible life and efficiency of Fisher Regulators on each type of gas. ◈ ◈ You will get the best possible design and construction to meet your distribution needs by ordering Fisher ...the "Specialized" gas regulator. ◈ ◈ Fisher's large production makes it possible to offer these additional features at the prices you are now paying for "stocked regulators." ◈ ◈ Bulletin No. 805 giving details, will be sent to you. Write—

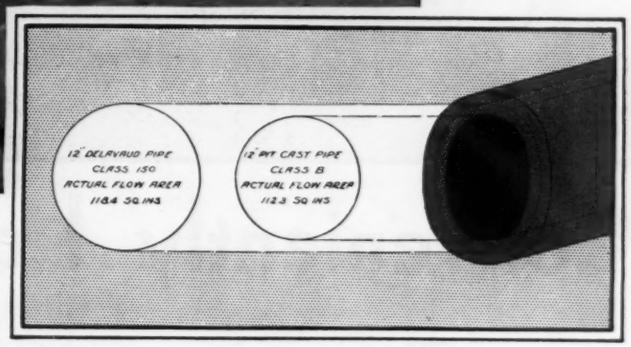
THE FISHER GOVERNOR COMPANY
2400 FISHER BUILDING MARSHALLTOWN, IOWA

FISHER

THE
MARK OF SCIENTIFIC
FLUID CONTROL



Above: The deLavaud machine in operation.



Below: Graphic illustration showing the greater carrying capacity of de Lavaud pipe.

This stronger flexible deLavaud pipe *has greater carrying capacity*

A cast iron pipe of greater strength, greater carrying capacity and uniform flexibility—such is deLavaud pipe. Its dense, even-grained metal shows an average tensile strength of 30,000 lbs. per square inch. This density results in reduced wall thickness for given pressures and increased carrying capacity of approximately 5% greater than that of pit-cast pipe.

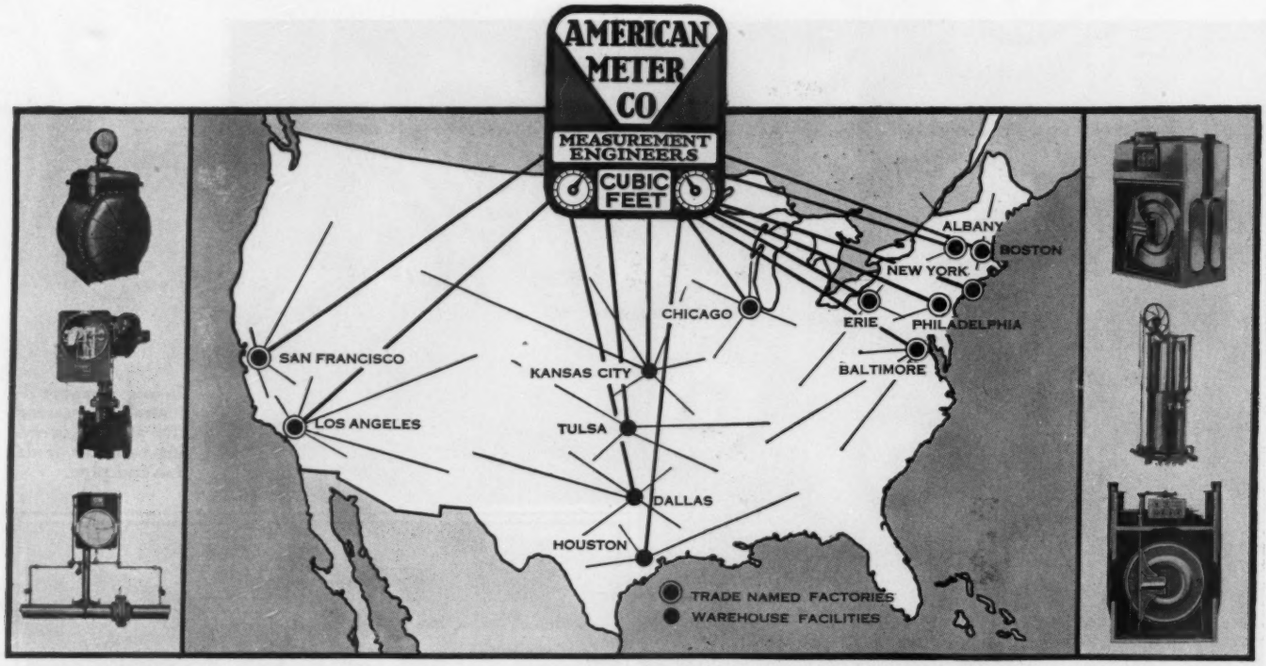
The density and even-grained structure of deLavaud pipe metal result from its unique method of manufacture. This pipe is produced by pouring molten iron into a rapidly revolving cylindrical metal mold. Centrifugal force holds the metal against the sides of the mold with a pressure resulting from a force many times greater than gravity. Immediately after coming from the machine, every length of deLavaud pipe is uniformly annealed in a specially constructed furnace where controlled heat eliminates all casting strains.

DeLavaud pipe is remarkably light in weight—easy and inexpensive to handle. Easy to cut and tap too. Manufactured in thicknesses and weights in strict accordance with the specifications of the American Water Works Association and the American Gas Association as well as the United States Government Specifications. The new deLavaud Handbook gives complete information. Write for your free copy today.

United States Pipe and Foundry Co., Burlington, N.J.

Our pipe bears the "Q-Check" trademark of The Cast Iron Pipe Research Association

Sales Offices: New York, Philadelphia, Pittsburgh, Cleveland, Buffalo, Chicago, Dallas, Birmingham, Kansas City, Minneapolis, Seattle, San Francisco, Los Angeles



Conveniently Located Factories

American Meter Company
New York
Established 1836

American Meter Company
Chicago
Established 1896

John J. Griffin & Company
Philadelphia
Established 1859

Helme & McIlhenny
Philadelphia
Established 1848

supported by nation-wide experience and facilities

Ninety-four years ago — shortly after the first gas plant was founded in this country — American Meter Company opened its first factory. Today American Meter Company supplies the gas industry from ten trade-named factories strategically located from coast to coast.

Each factory is an integral part of a comprehensive manufacturing organization, supervised by trained engineers. Each American Meter is made to the highest standards of accurate measurement and economical service.

Old Types Improved
New Types Developed

A pioneer in the manufacture of gas meters, American Meter Company is still pioneering in the development of improved gas measuring and testing apparatus.

With increasing experiment and intensive research, the engineers of American Meter Company are constantly improving established meters, and developing new equipment to meet new requirements.

Many Branches Provide Intensive Local Service

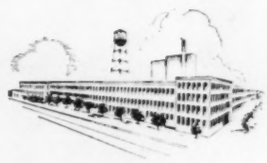
The geographical distribution of American Meter Company branches assures quick delivery and prompt engineering and shop service. It also permits an intensive knowledge of local conditions and their specific requirements.

Whenever you have a meter problem call in an American Meter Company representative. He will gladly bring to its solution a personal interest, supported by the experience of extensive laboratory experiment and of gas measurement practically applied in every part of the country.

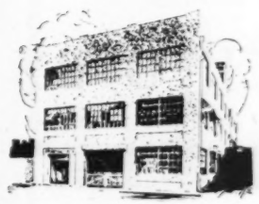
"Gas Measurement Engineering," a periodic publication of American Meter Company will be of interest to you—also the complete index to this Company's other printed information. We will be pleased to place your name on our mailing list.

D. McDonald & Company
Albany
Established 1855

Maryland Meter Works
Baltimore
Established 1866

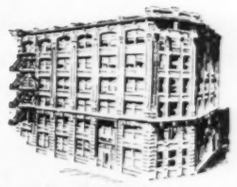


Metric Metal Works
Erie, Pa.
Established 1888



Pacific Meter Works
Los Angeles
Established 1901

Pacific Meter Works
San Francisco
Established 1901



Nathaniel Tufts Meter Works
Boston
Established 1860

AMERICAN METER CO. MEASUREMENT ENGINEERS CUBIC FEET

AMERICAN METER COMPANY

Incorporated

General Offices: 105 West 40th Street, New York, New York . . . . Established 1836

THE WORLD'S LARGEST MANUFACTURERS OF GAS METERS AND ALLIED APPARATUS

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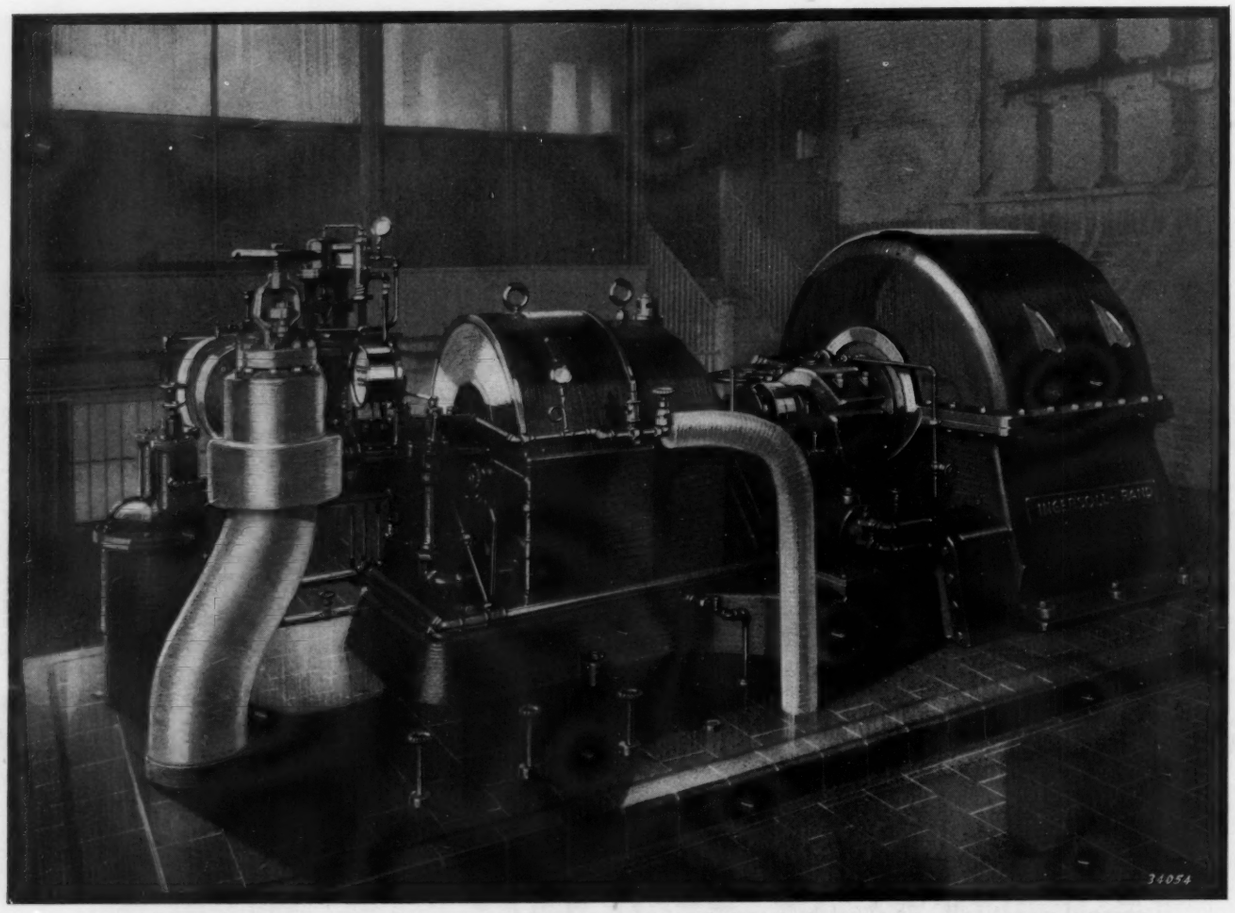


BACKED BY RESEARCH AND EXPERIENCE

The turbine-driven centrifugal gas booster shown above is one of 18 Ingersoll-Rand turbo units now successfully operating in several plants of a public utility company in a large Middle Western city. It has a capacity of 550,000 cu. ft. of gas per hour at 6 pounds discharge pressure. It is equipped with constant pressure regulation.

Ingersoll-Rand Company has supplied centrifugal blowers to leading gas companies in every section of the country. Each unit is a product of an experience that goes back nearly 20 years. This experience qualifies the engineering staff to solve any problem in regulation and to supply the most suitable system to meet each case.

A modern research department is constantly on guard to see that the most suitable materials are employed throughout. Rigid specifications are enforced in every detail of manufacture, and a system of thorough inspection eliminates defects and insures accuracy of parts. Every care is exercised to secure correct alignment and proper clearances. Exhaustive shop tests are run on every unit before it is passed for shipment.

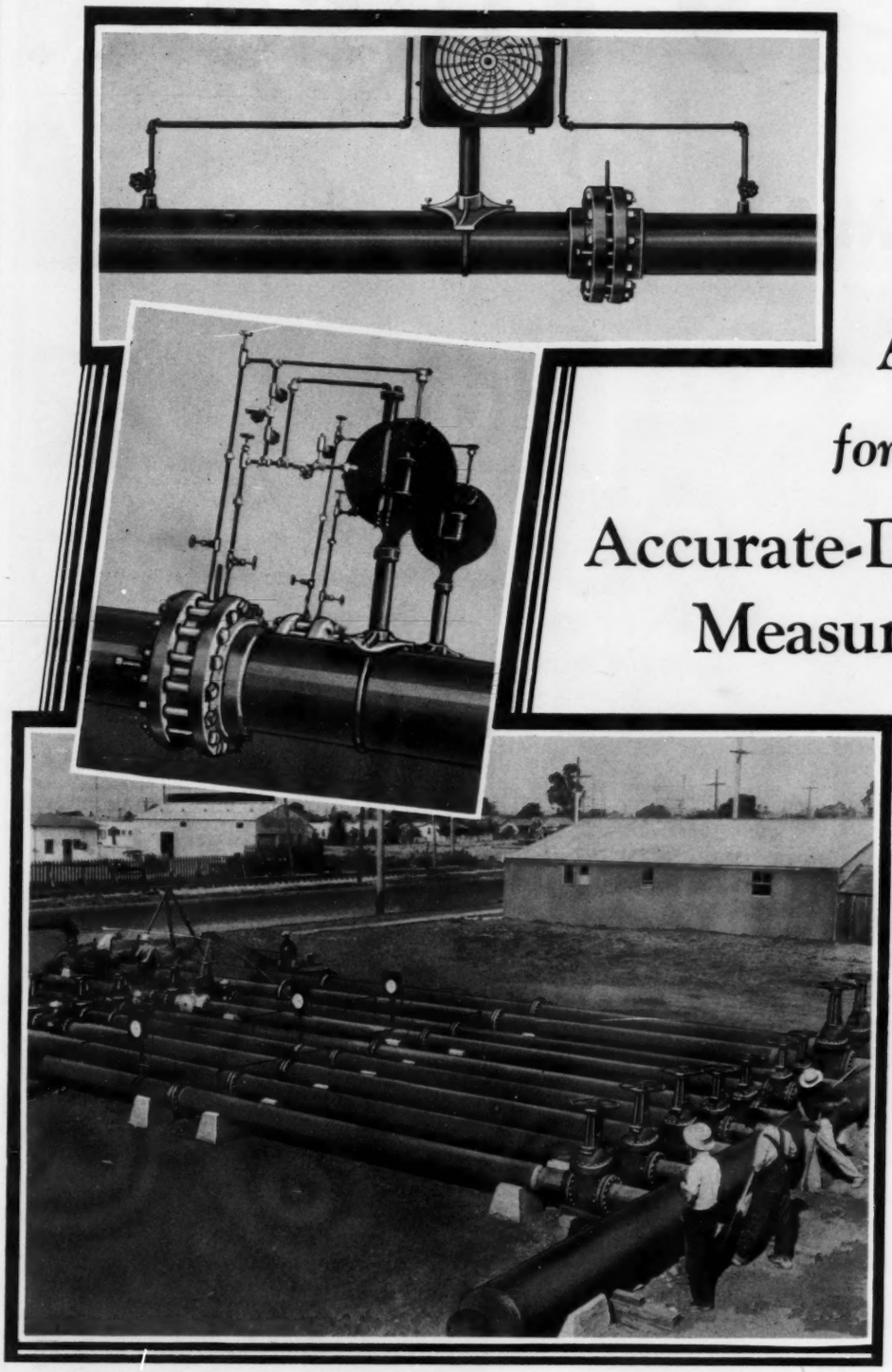
INGERSOLL-RAND CO.

OF CALIFORNIA

1460 E. Fourth St. Los Angeles

72-T

Ingersoll-Rand



Papico Orifice Meter Assemblies *for* Accurate-Dependable Measurement

Complete Meter Runs of Smooth Wall Calibrated Pipe. Van Stone Laps. No Breakage! Special Pressure Tap Construction. True Differentials!

Perfection Duplex Traps for Gauge Protection

Papico Equipped—Southern California Gas Company's West Los Angeles Terminal

Write for Catalog H

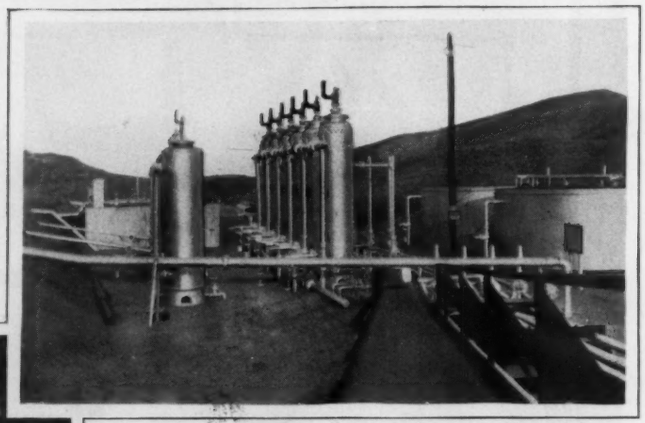
Pacific Pipe & Supply Company

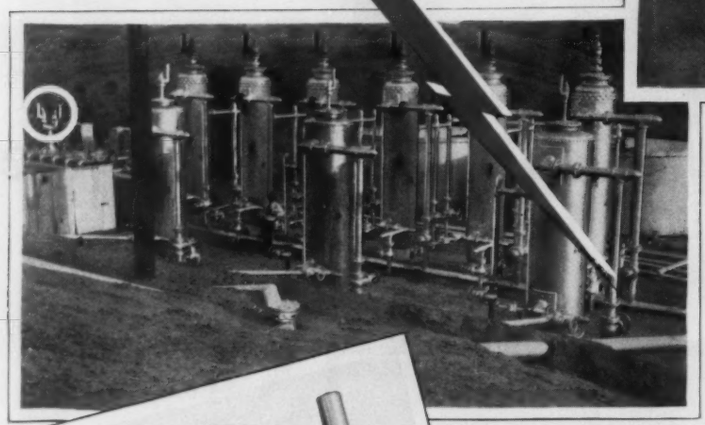
1002 Santa Fe Avenue
Los Angeles, California

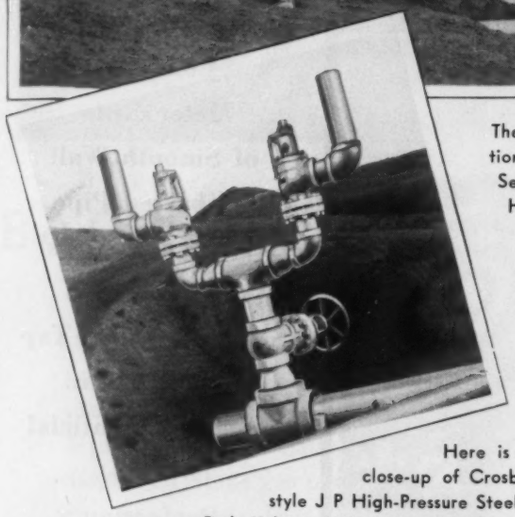
Papico Multi-Tube Straightening Vanes

Orifice Discs. Flow Tubes for Use with Self-Contained Fittings

SAFETY FIRST...
AT KETTLEMAN HILLS







The two larger illustrations show a typical Trap Set-up at Kettleman Hills—fully protected by the Crosby Steel Body Valves shown at the extreme left of above photo.

Here is a close-up of Crosby style J P High-Pressure Steel Body Valves which protect the Set-up.

LIGHTNING recently ignited all the stacks on the gasoline plants at Kettleman Hills. On one particular plant, two (CROSBY) *High-Pressure, Steel Body, Forged Chrome Nickel, Nozzle Seat Valves* were called upon to relieve the entire plant capacity. They delivered in the emergency... handling approximately 80 million cu. ft. of gas per 24 hours... protecting lives, and valuable equipment. FOR SAFETY'S SAKE . . . use CROSBY High-Pressure Nozzle Type Steel Valves!

SALES AGENTS FOR:
Crosby Steam Gauge and Valve Co.
Metric Metal Works of American Meter Co.
Taylor Instrument Companies*
Davis Regulator Co.
The Meriam Co.
Reliance Mfg. Co.**

SALES REPRESENTATIVES FOR:
Robinson Orifice Fitting Co.
Chaplin Fulton Mfg. Co.
Bristol Co.
Also a Complete Line of Laboratory Supplies

*California Field only **Mid-Continent Field only

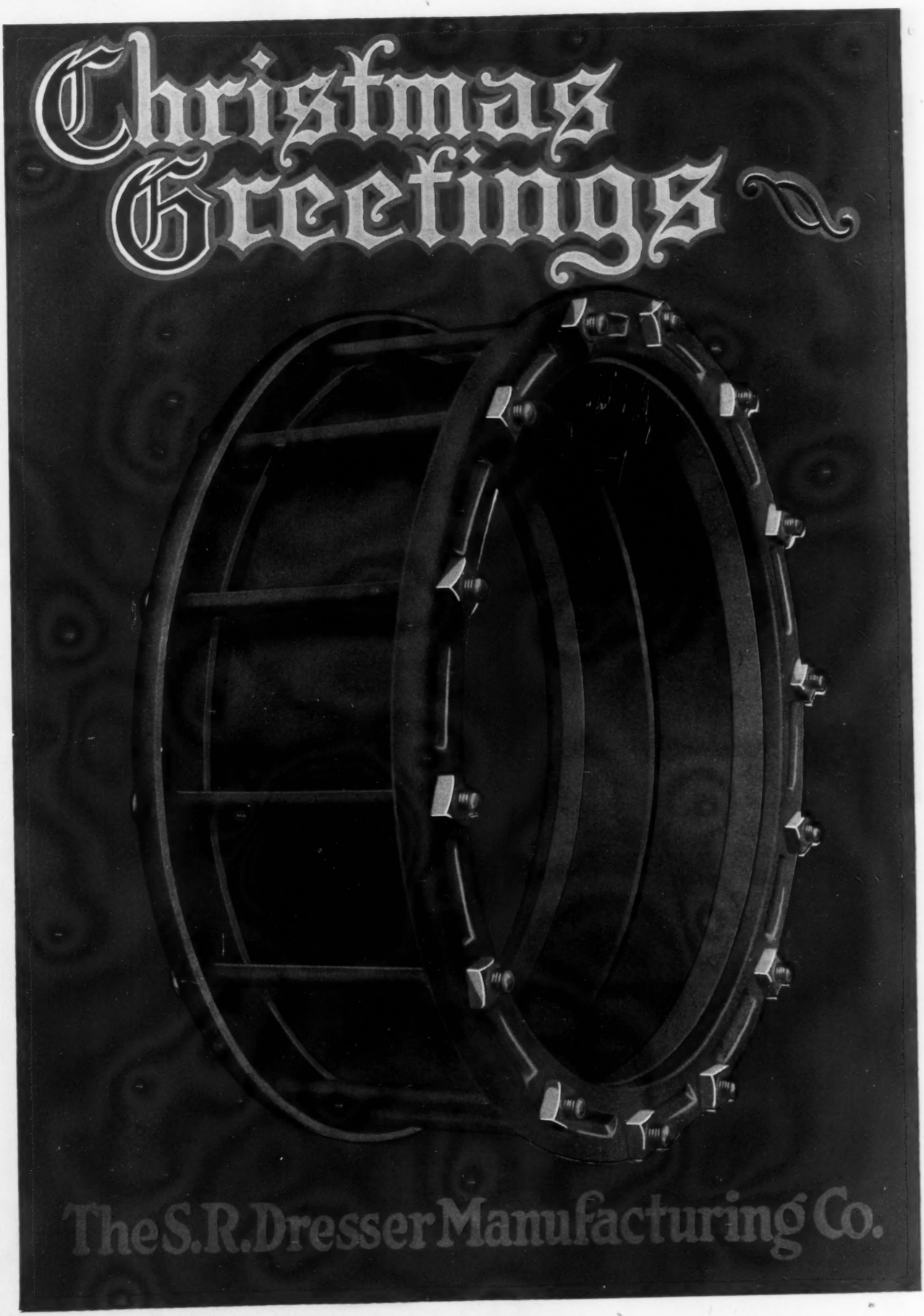
FIELD SERVICE

Westcott & Greis Engineers are available at all times to help you solve your measurement and control problems.

★ Follow our Story of Application of Measurement and Control Equipment "From Field to Consumer" in future issues of Western Gas.

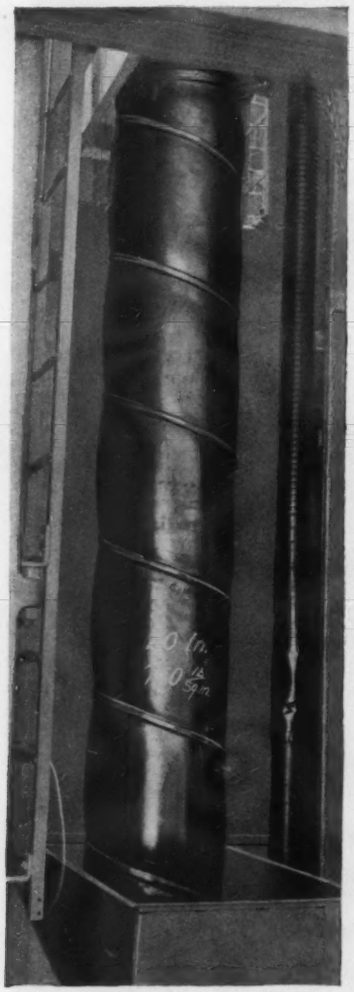
WESTCOTT & GREIS
MEASUREMENT AND CONTROL

LOS ANGELES TULSA HOUSTON DALLAS


Christmas
Greetings
The S. R. Dresser Manufacturing Co.

LIGHT WEIGHT Naylor Pipe

Withstands High Pressures



20-inch Naylor Pipe in Testing Machine during Internal Hydrostatic Pressure Tests

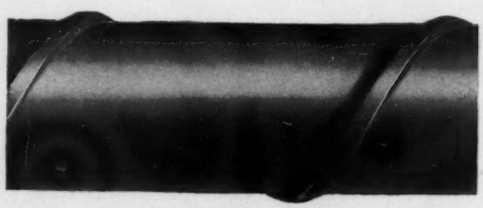
No. 2—Internal Hydrostatic Pressure Tests.

Every length of Naylor Pipe is tested to the pressures indicated in the following table:

Diameter of Pipe	Mill Test Lbs. per Sq. In.	Diameter of Pipe	Mill Test Lbs. per Sq. In.
6″	900	14″ O. D.	450
8″	800	16″ O. D.	400
10″	700	18″ O. D.	350
12″	500	20″ O. D.	325

Extensive tests recently made by Professor M. L. Enger and W. M. Lansford of the Materials Testing Laboratory of the University of Illinois, bear out the soundness of this practice.

In the course of these tests it was shown that the bursting strength of Naylor Pipe computed in accordance with the formula $p = \frac{2ts}{d}$ was less than the bursting strength found by experiment. This means that the Naylor Structure is definitely responsible for an increase in resistance to internal hydrostatic pressure.



Catalog 30-2 gives you complete engineering and metallurgical data.

NAYLOR PIPE COMPANY, Main Office & Plant, 1230 E. 92nd St., CHICAGO

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Monterrey N. L., Mexico
Representative in Mexico

TONCAN COPPER

Naylor Pipe

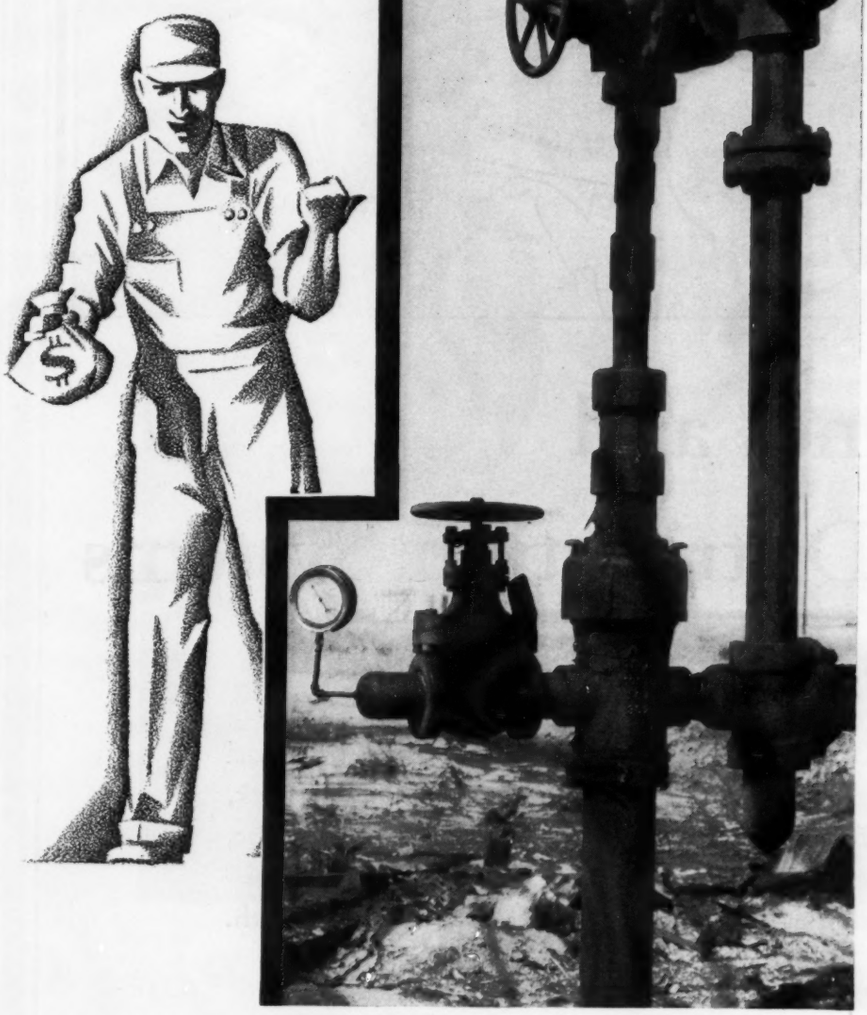
Maximum Structural Strength — Mo-lyb-den-um IRON — With Minimum Weight

Standardized Naylor Pipe is made in sizes 6″ to 12″ I. D. and 14″ to 20″ O. D. in any uniform length desired up to 40′0″. Ends made to wrought pipe standards for all types of coupling.

Toncan Copper Molybdenum Iron possesses a superior corrosion resistance, making it the favored pipe material.

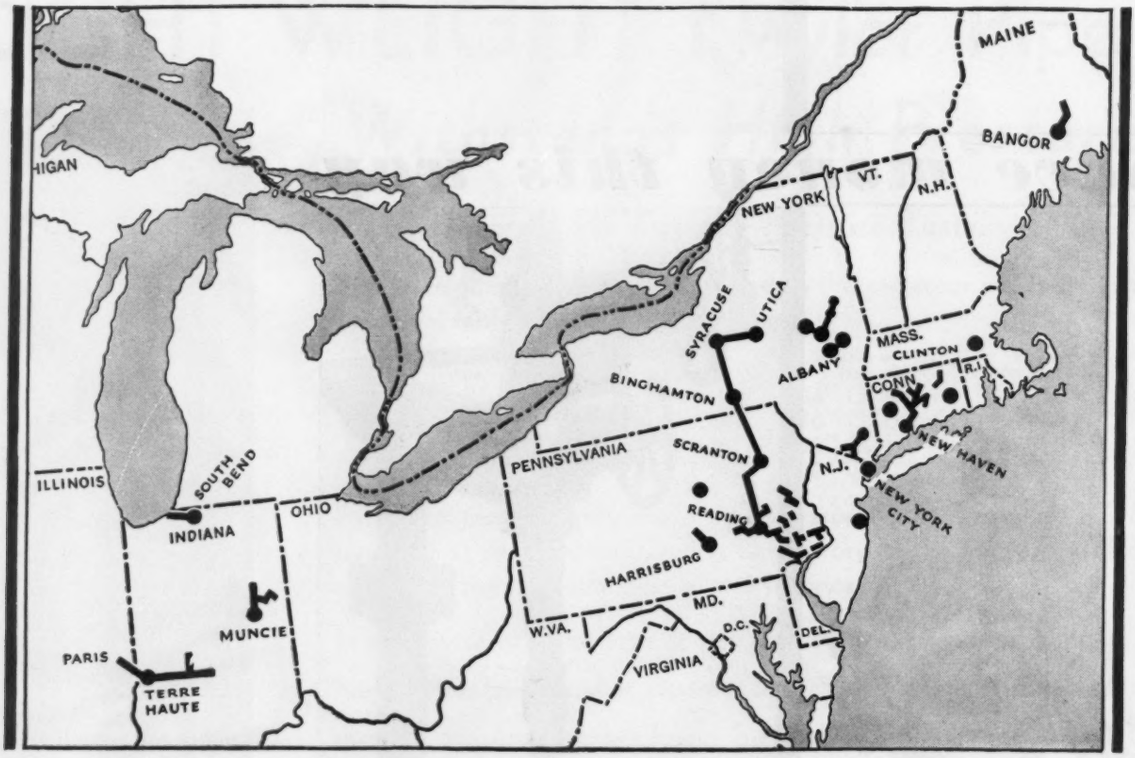
Where corrosion is not a problem, Naylor Pipe can be furnished in steel.

Save money this way



On many ordinary hook-ups it is not necessary to use steel valves. Westcott Alliron Valves and Fittings are made of semi-steel castings of extraordinary tensile strength. Their first cost is lower and they are equally safe. Each is tested to double its rated working pressure—a margin of safety far beyond the most gruelling service gate valves are subjected to. Full stocks are carried in all stores of The Continental Supply Company and at the Westcott Valve Co., East St. Louis, Ill.

WESTCOTT VALVES



Pipe Lines and Gas Distribution Systems

completed or under construction

COMPLETELY organized with equipment and personnel for pipe line construction and gas distribution work, we can efficiently and economically handle jobs of any size, from a few thousand feet of gas distribution main to cross-country oil, natural gas or gasoline lines of any length.

THE U. G. I. CONTRACTING COMPANY
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MAXIMUM RETURN TO CLIENTS PER DOLLAR INVESTED

WALCO

Pipe Wrench

MADE BY WALWORTH (PATENTED)

- Forged 1-piece bar and frame *new*
- Fewer parts *new*
- Easier action *new*
- Greater Strength

Made especially to withstand hard use in gas service.

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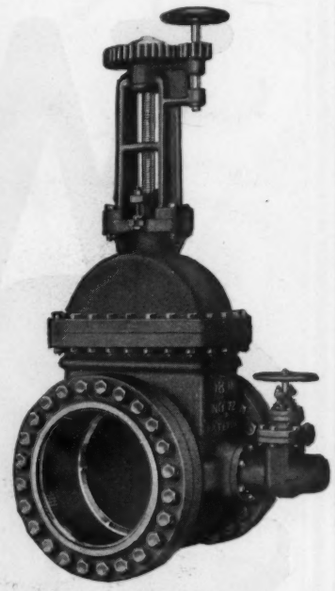
. . . Distributors in Principal Cities of the World . . .

General Sales Offices: 60 E. 42nd St., New York

WALWORTH CALIFORNIA CO., 235 Second St., San Francisco

WALWORTH COMPANY, 809 Fourth Place, Los Angeles

Cutting out trouble and waste . . . all along the line



Darval Semi-Steel Gate Valve, Dar-a-loy trimmed—for natural gas pipe lines and compressor stations.

Simplicity of design, few moving parts which are interchangeable and unusually sturdy construction, give Darling Gate Valves those EXTRA years of trouble-free service so essential for really economic cross-country transportation and distribution of gas.

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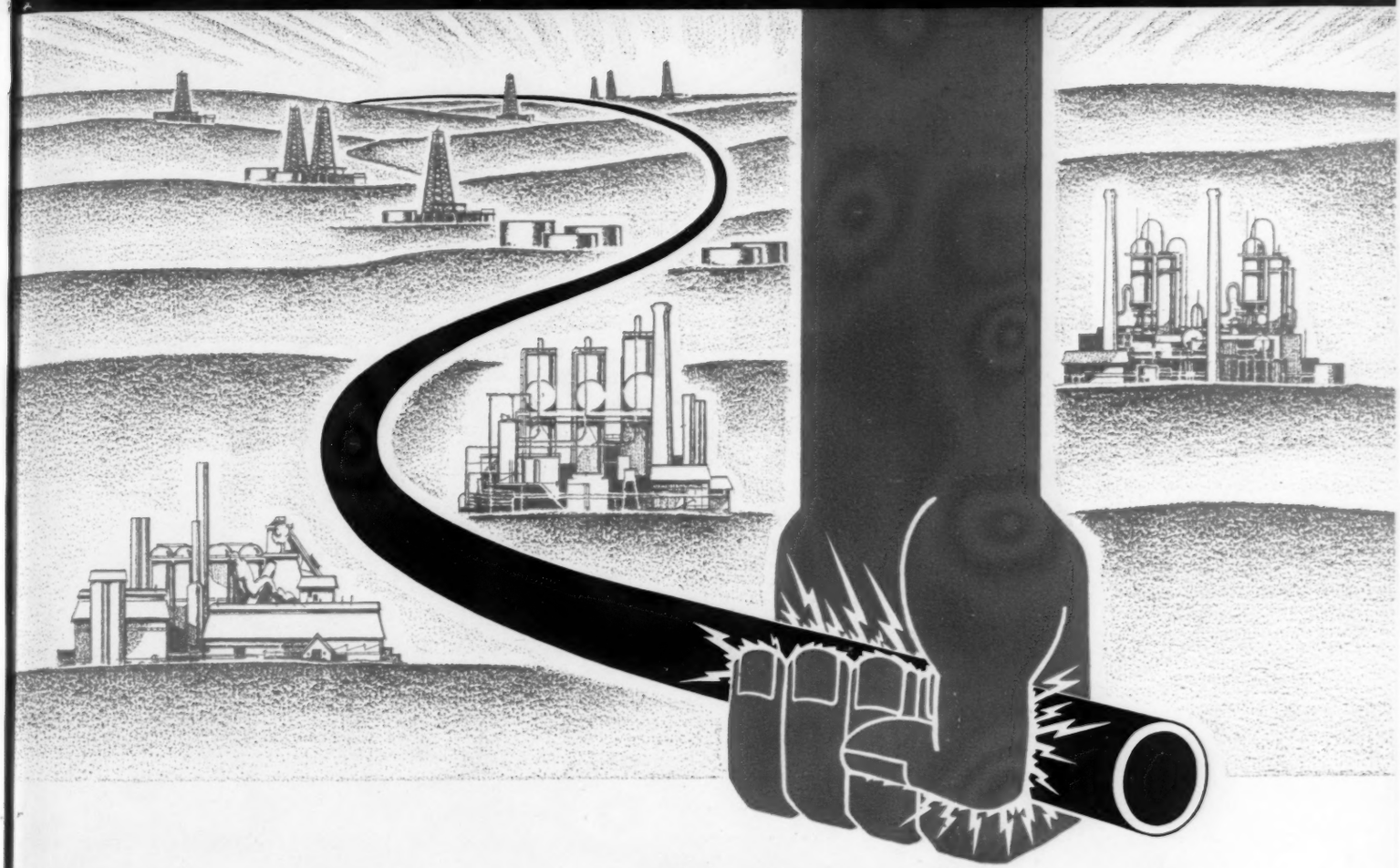

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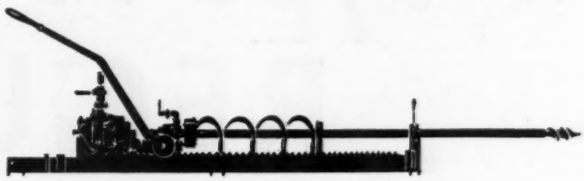

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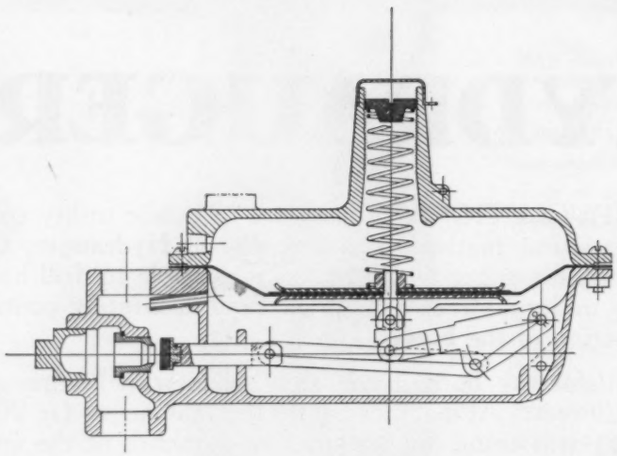

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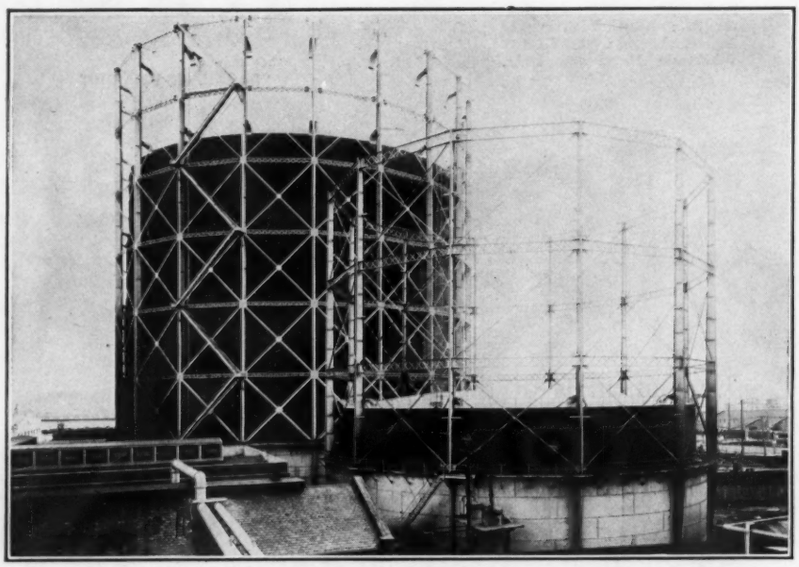

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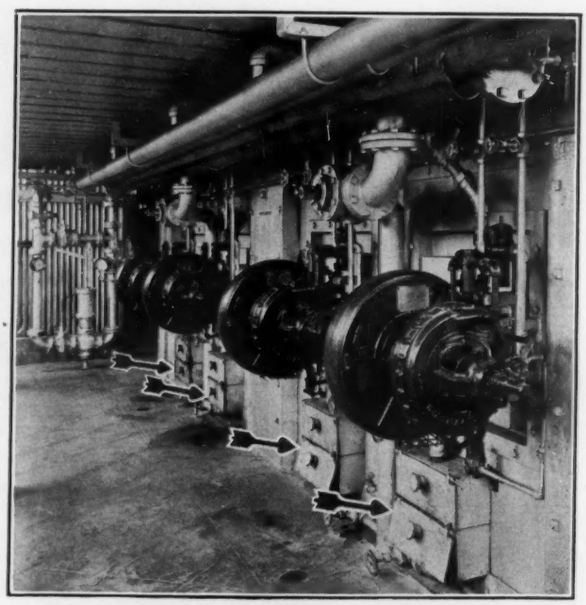

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Fundamentals *of the* Utility Merchandizing Problem

By H. C. DAVIDSON

Secretary, Consolidated Gas Company of New York

MORE than 300 sales executives from Southwestern states, present at the first Southwest Natural Gas Sales Conference, at Dallas, Texas, November 13-14, heard Mr. Davidson's frank exposition of the economics which underlie utility merchandising. The author urges the solid support of the industry behind a policy which not only will protect the inherent promotional rights of the companies, but will establish the soundness of utility merchandising policies in the mind of the public. Close analysis of merchandising and other load building costs in a form permitting ready comparison between companies is an essential preliminary, says Mr. Davidson. Extracts of his paper appear in these pages.—*Editor.*

THE merchandising problem of natural gas and manufactured gas, and of electricity for that matter, are fundamentally the same. We stand or fall together, dependent upon the soundness of the promotional policies of the industry as a whole.

What is the merchandising problem of the utilities? What is there about it that entitles it to the distinction of being one of the outstanding problems before the industry today? It is a combination of two questions—the internal problem of successful management, and the external problem of public understanding and public acceptance of the inherent promotional character of all utility merchandising.

The Internal Problem

You are all familiar with the internal problem of determining the amount you can afford to spend profitably for the purpose of inducing your customers to use more gas. In the analysis of these operations, the gas industry has not kept pace with the standards of research in commercial business. Generally speaking, it has been able to measure the results only in totals or at best in a few general classifications. The surface has barely been scratched in the scientific correlating of gas sales by the various classes of business, with expenditures for promotion allocated in like manner.

The tendency for each company to follow its own independent policies has died hard. There seems to have been little inclination to search out what is best for the industry as a whole, and to support that program. Nor have the companies made the most of their opportunities in gaining the benefits of inter-company comparisons, beyond the borders of affiliated organizations.

As a result, sharp differences exist in company policies as to merchandising methods, installment terms, trade cooperation, and even as to what is merchandising and what is promotion.

As an example, cases have come to my attention of installment policies in effect, requiring but a small "down payment," and permitting the balance to be spread over a period as long as five years, where the apparent aim seems to be to put appliances on the district at any cost. Such liberal installment terms are usually the result of over-zealous sales effort to make a showing, and are evidence, I believe, of the need of a good aggressive accountant on the job to ascertain the real facts.

Personally, I take issue sharply, as a matter of business judgment, with such policies, and believe they cannot escape being expensive in the final analysis. I do not mean by that, however, to set up my opinion above the opinion of others. Instead, it is merely evidence that there are different schools of thought within the industry, which should be reconciled as a matter of "putting its house in order."

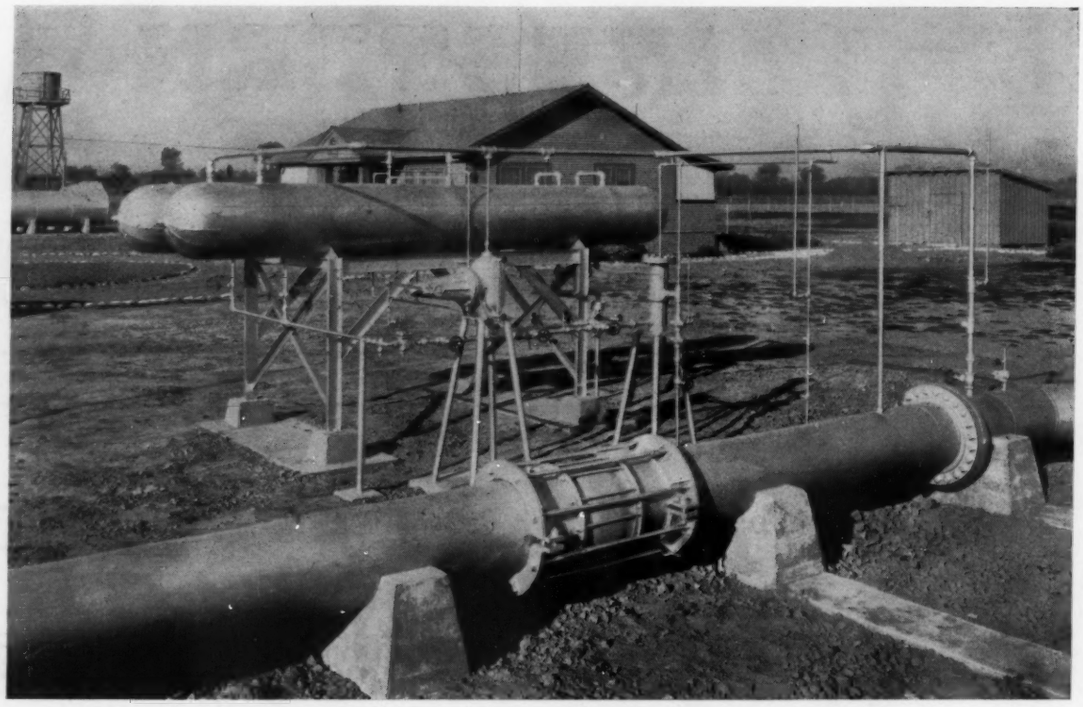
So much for the internal aspects of the question. There is evidence aplenty that we need to study it as an efficiency problem.

The External Aspect

The external aspect is far more important and more pressing. The repeated allegations of unfair competition by representatives of trade associations, lay down a challenge to the industry as to the propriety of its merchandising policies, which strikes to the very root of its right to sell appliances as a necessary part of the promotion of gas.

In spite of the declarations of principles adopted a year or two ago by both the gas and electric industries with the interested trade associations, it is evident that the efforts are undiminished to bring about legislation to prohibit, if possible, the sale of appliances by the utilities, or to compel merchandise sales to be conducted as a non-operating enterprise, unrelated to gas promotion.

(Continued on Page 64)



AT RIGHT

Atomizing odorizer of the P. G. and E., at Milpitas Meter Station. Two units of this type are located at Milpitas, one odorizing gas for San Francisco and the Peninsula, the other for all East Bay consumption. About 75 million cu. ft. of gas and 300 gallons of odorant pass through this station each day.

ATOMIZING *and*

By PHILIP E. BECKMAN

THE Pacific Gas and Electric Co. first began the distribution of natural gas at San Jose in September, 1929. Since that time considerable study has been directed toward the economical automatic introduction of an odorant into natural gas. Fortunately, an odorant oil designated as Calodorant No. 1 had by this time been developed through the joint efforts of the Standard Oil Co. and the Los Angeles Gas and Electric Corp. It was decided to use this odorant, since its efficacy had been proven. There followed a period of many months during which time it was introduced in the form of drops or a stream into a pipe line. Meanwhile, Calodorant No. 3, an oil of greater volatility and adaptability to higher gas pressure, became available. While the simple method of introduction was fairly satisfactory, yet subsequent drippage foretold annoyance in the future when gas pressures must be raised to care for heavier loads. Automatic regulation, moreover, had not yet been realized.

Since the Odorization Committee's 1930 report[1] has so thoroughly covered all other features of this subject, this paper will deal only with the theory, experimental work, design and results coincident with the introduction of odorant oil into natural gas by two apparata designed by the Pacific Gas and Electric Co. One of these odorizers, for large flows, effects the atomization of the odorant, and the other, a wick type for small flows, depends upon direct vaporization. They will be considered in turn.

In designing the odorizers the qualifications were that no power was to be used, that no high pressure gas be required, that the apparatus must regulate itself automatically, and that but little attention be needed. These conditions were necessarily imposed because of the distance between odorizers and company headquarters.

Saturation Limits

Calodorant No. 3 possesses fractions having low vapor pressures, the volatilizations of which are of importance since any drippage constitutes a nuisance to be avoided if possible. The vapor pressure and molecular weight aid in the determination of saturation limits. Vapor pressures were determined by a method applicable to hydro-carbons, particularly gasolines, since Calodorant No. 3 is not dissimilar to this family. While not extremely accurate, this method is close enough for practical requirements and is here mentioned for general interest.

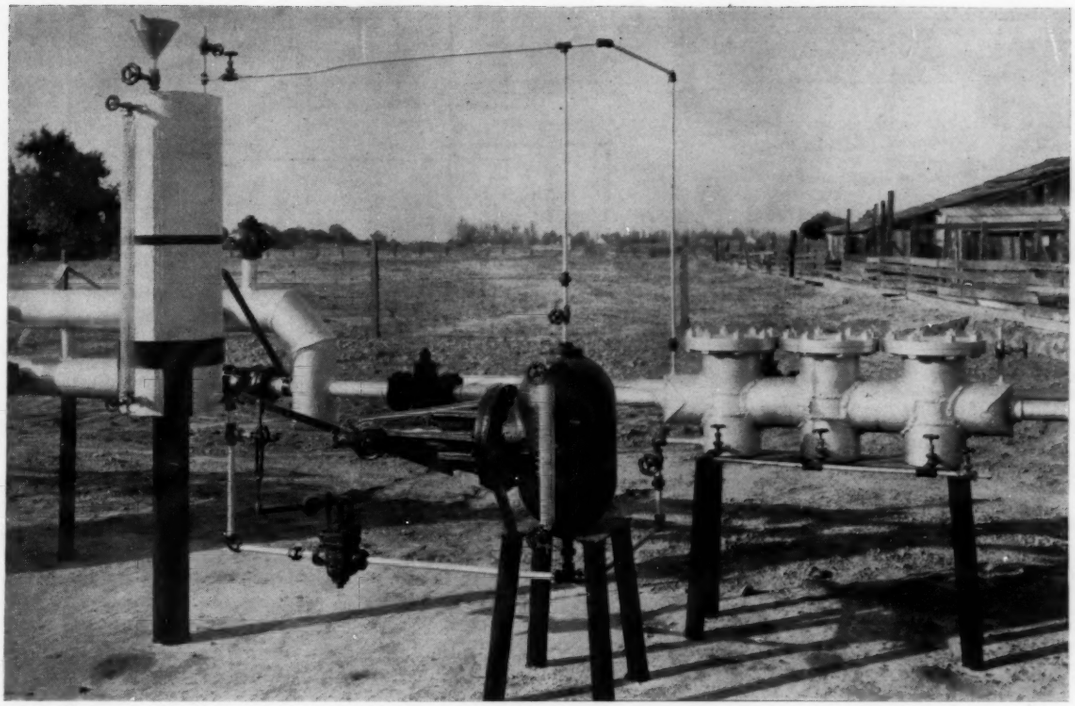
It has been found that the normal dewpoint (temperature 100 per cent vaporized) of a gasoline bears a fairly definite relation to its temperature at 90° distillation as determined by the A.S.T.M. procedure.[2]

$$\text{Normal Dewpoint °F. abs. (at 760 m.m.)} = \frac{\text{90\% A.S.T.M. temp. °F. abs.}}{1.084} \qquad (1)$$

One point on the vapor pressure-temperature curve is then available. Extrapolation on the familiar Cox Chart[3] gives the vapor pressures at pipe line temperatures. The molecular weight may be determined by the Beckmann method employing the lowering of the freezing point of benzene.

DATA ON CALODORANT NO. 3

A.S.T.M. Distillation Per Cent Over	Temp. °F.
10	212
20	241
30	262
40	279
50	297
60	313
70	331
80	349
90	379
End Point	424



AT LEFT

Wick odorizer at Newman Meter Station. This type of odorizing apparatus was designed for low rates of gas flow, since the atomizing type of installation was not practical for use at rates under 2500 cu. ft. per hour. Four stations of the wick type are in service for the Pacific Gas and Electric Company.

WICK *Odorizers*

Assistant Engineer
Department of Gas Construction
*Pacific Gas and Electric Company**

Molecular weight = 105 (Beckmann Method)
Normal Dewpoint =

$$\frac{379 + 460 - 460}{1.084} = 314\ ^\circ\text{F. (at 760 m.m.)}$$

Specific Gravity = 0.825

(It will be noted that the molecular weight is lower than values previously quoted; no reason for this can be assured. Perhaps such a variation is not unusual due to changes in odorant concoction from time to time.)

Vapor Pressures (Cox Method)	
Temp. °F.	Press. m.m. Mercury
32	0.9
55	2.0
75	3.7
95	7.3

A survey of pipe line temperatures during the winter of 1929-30 gave a mean low of 55° F. Although colder conditions obtained they were for but short durations of time and their effect on condensation would have been negligible. The computed saturation limits for various gas pressures at 55° F. are given below:

Gauge Pressure lbs. per sq. in.	Gallons to saturate 1 M.M. cu. ft. gas
0	107.0
10	64.0
50	24.4
100	13.7
150	9.5
200	7.3
300	5.0
400	3.8

The optimum odorizing rate has not yet been established. Probably the greatest concentration will not exceed 4 gallons per M.M.cu.ft. of gas. It will be noticed that this value lies precariously close to theoretical saturation at high pressures. It is necessary then that the odorant be introduced in such a manner that intimate mixing obtains so as to hasten vaporization; otherwise the liquid will gather in low points of the pipe line. As the liquid depth in these pockets increases a very slight increase in vaporizing surface is presented, resulting in an accumulation of the less volatile fractions. This condition has been prevalent during the past.

Atomizing Odorizer

Eliminating vaporization by heat, some form of mechanical atomization seems favorable for odorant introduction in large quantities. Early designs incorporating this feature proved to be undesirable because of low efficiency, undependable automatic regulation and a need for constant attention. The present type of apparatus seems to have overcome these faults. The principle is as follows:

A standard form of Venturi tube is installed in a gas line, serving both as an agent for producing an operating differential proportioning odorant to gas flow and providing, at the throat, a region of high gas velocity wherein an odorant might be introduced in such a manner as to be thoroughly atomized. The total gas flow actually envelopes the nozzle and support through which the odorant is introduced.

A Venturi satisfies these requirements admirably, as compared to an orifice, since its high efficiency permits a very small throat with high gas velocity and consequent fine atomization. Its minimum turbulence discourages odorant separation onto the conduit walls near the point of entrance, thus prolonging odorant suspension which benefits vaporization. A small throat, too, creates a workable operating differential for odorant control.

The general arrangement of the apparatus is shown in Fig. I. Regulation by means of a flow-differential is nothing new, but several features of the apparatus are worthy of mention.

The Venturi tube is quite economical in construction. Thin gauge metal is

*Presented before the Technical Section, Pacific Coast Gas Association, at the regional conference held at San Francisco, November 20-21, 1930.

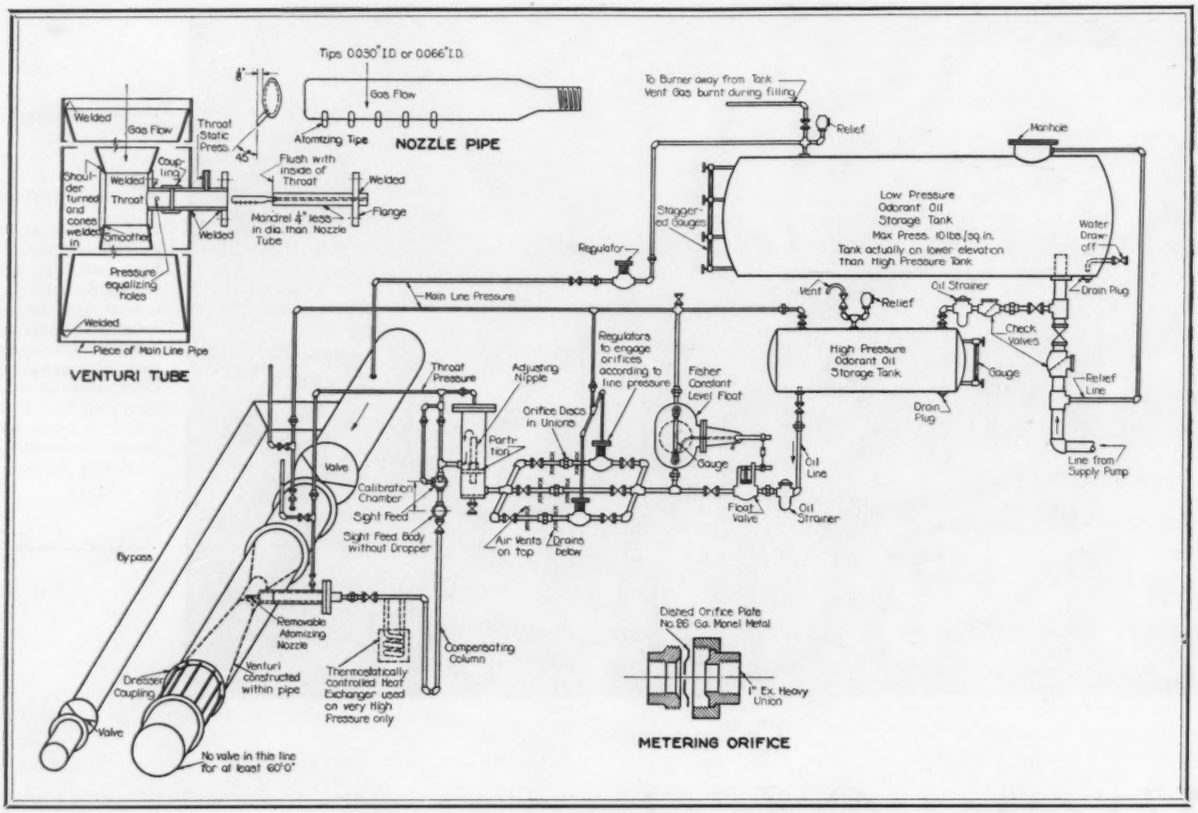


Fig. I. General arrangement of atomizing odorizer.

used for entrance and exit cones, each cone being shaped in halves. These are then welded to an appropriate size pipe serving as a throat and also to the walls of a section of the main pipe line. A balance of pressure within and without the cones practically relieves all stress.

An externally operated float valve is used to facilitate the adjustment of the odorant level to any desired position for construction purposes or for "idling" rates. Normally, the level chamber overflow and float chamber liquid level are at the same elevation. The choice of float valves is of great importance. The original valves used were of the balanced double disc type; they proved to be unsatisfactory since a positive shut-off was impractical. When the liquid level rose during operation this added head increased the odorizing rate; moreover, there always remained the danger of flooding the float ball which was of the balanced pressure type. The valves were finally rebuilt to the needle type. Here again care must be taken to make the needle passages and seat ample in size, since the friction through the valve may require excessive opening which necessitates a lower liquid level in the float chamber and reduces the odorizing rate.

Orifice plates which meter the odorant are dished of No. 26 gauge monel metal and clamped between the faces of a standard 1-inch union. Any leakage is then directed to the outside. Since it is desired to maintain a given concentration of odorant in the gas at atmospheric pressure, the odorizing rate varies inversely with the square root of the line pressure in atmospheres; this may be corrected for as follows: Several orifices may be in parallel, brought into play through snap regulators opening at higher line pressures. The arrangement would be cumulative, the first orifice operating constantly at lowest pressures, the second adding its discharge to that of the first when a higher pressure is reached, and so on. Normally, pressures do not vary considerably and this expedient is not necessary.

The two sight feed glasses with the valve below constitute a testing device; the time to fill the known volume between etched lines on the glasses together with the simultaneous gas flow indicates the odorizing rate.

The greatest advantage claimed for this odorizer, of course, lies in the atomizing feature. The streamline nozzle with its several tips, shown in Fig. I, is inserted in the throat where the gas has a high velocity. The gas whips over the tips and atomizes the odorant much as is done in the conventional overshot tree, insect or paint spray, except that the entire nozzle is enveloped in a gas stream.

The head necessary for the nozzle tips discharge or the aspiration induced is entirely balanced by the compensating column. Neither of these variants has any effect upon the metering orifices. The orifice piping also is ample in size so as to have an insignificant friction head.

The high and low pressure storage system are of the usual type, regulated high pressure gas being used to flow the odorant from the low to the high pressure tanks, thus economizing on foundations.

Atomization Theory

The differential velocity between a liquid drop and a gas stream exerts a force on the drop which is resisted by the drop strength. Due to the method of odorant introduction the above might be specifically stated thus. When a liquid is introduced into a swiftly moving gas stream normal to the direction of gas flow it is torn into drops the maximum size of which bear a definite relation to the velocity of the gas.[4] An equation is accordingly deduced from the assumption that:

Strength of drop = Viscous resistance + eddying resistance, or

$$(3.1416)\ D\frac{S}{2} = 3\ (3.1416)\ n\ DV + 0.172\ d\ D^2V^2 \qquad (2)$$

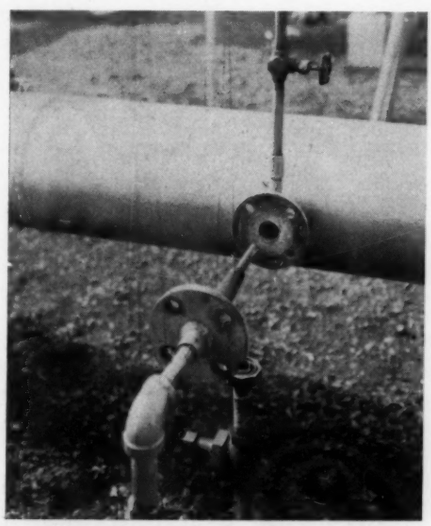
Where
D = Drop diameter in feet,
V = Gas velocity in feet per sec. = tearing velocity,
S = Surface tension of odorant in lbs. per foot,
n = Coeff. abs. viscosity of gas in lb. sec. per feet^2,
d = Density of gas in lbs. mass per cu. ft. = 0.0765 × (spec. gravity) × (N/G) where N = pressure in atmospheres.

(In the above the drop is considered as having assumed a pear shape before breaking, the rupture occurring at a diameter one-half that at the main body. This accounts for the strength being (3.1416) D S/2 rather than (3.1416) D.S.)

Specific values of S and n are as follows:
$S = 1.90 \times 10^{-3}$
$n = 0.220 \times 10^{-6}$ for natural gas
$n = 0.376 \times 10^{-6}$ for air

The liquid after having been torn into small drops will finally assume the gas stream velocity. The reciprocal of its falling velocity will then be a measure of its persistence. This mathematical relation may be developed similarly by merely replacing the drop strength by the drop weight.

In Fig. II the relation of gas velocity and pressure with degree of atomization has been plotted by substitution in the formula above. From the literature[4] it appears that good atomization occurs at a drop diameter of 4×10^{-4} feet and fair at double this diameter; below the latter value it is better termed a fine spray. What is commonly called persistent fog[5] comprises but a small portion of the abscissa scale, being of the magnitude of 1/2 micron or 1.6×10^{-6} feet. The drop sizes mentioned, of course, remain constant only when the enveloping gas stream is saturated; when an unsaturated gas is the atomizing agent then these drop sizes are instantaneous only since vaporization quickly diminishes their size. It is quite probable then that the troublesome less volatile fractions approach a persistent fog in drop size. In this condition they present no difficulties since their carrying power is great, prolonging the period for vaporization, and their inertia small, thus discouraging impingment and wetting of the pipe walls.



Atomizing nozzle, shown removed from Venturi throat.

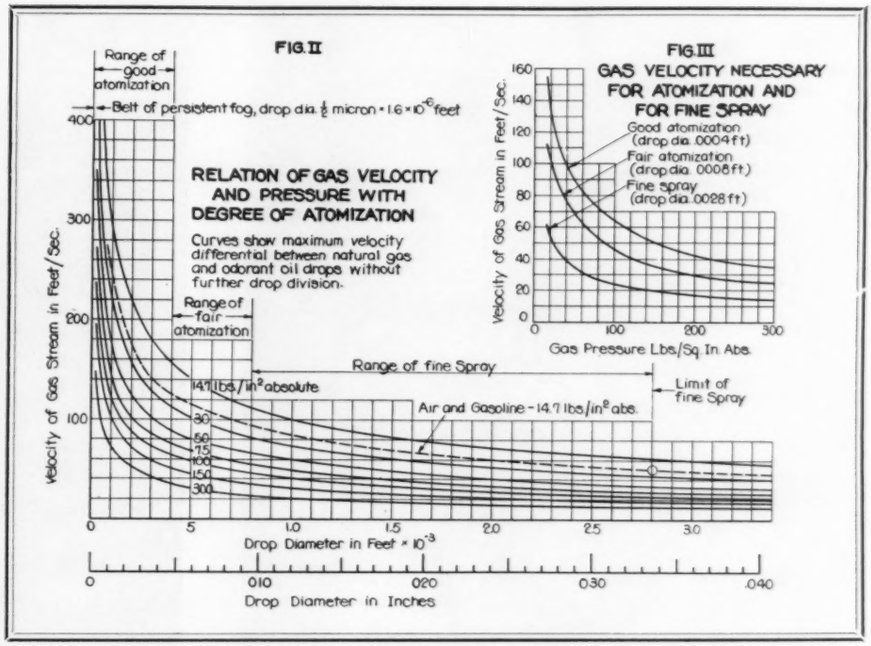


FIG. II
Range of good atomization
Belt of persistent fog, drop dia. 1/2 micron = 1.6 × 10⁻⁶ feet
RELATION OF GAS VELOCITY AND PRESSURE WITH DEGREE OF ATOMIZATION
Curves show maximum velocity differential between natural gas and odorant oil drops without further drop division.
Range of fair atomization
Range of fine Spray
Limit of fine Spray
14.7 lbs./in² absolute
Air and Gasoline - 14.7 lbs/in² abs.
30
50
75
100
150
300
Velocity of Gas Stream in Feet/Sec.
Drop Diameter in Feet × 10⁻³
Drop Diameter in Inches
FIG. III
GAS VELOCITY NECESSARY FOR ATOMIZATION AND FOR FINE SPRAY
Good atomization (drop dia. .0004 ft)
Fair atomization (drop dia. .0008 ft.)
Fine spray (drop dia. .0028 ft)
Velocity of Gas Stream in Feet/Sec.
Gas Pressure Lbs./Sq. In. Abs.

In Fig. III is a useful adaptation of Fig. II, giving the necessary gas velocities directly for different degrees of atomization and variations of line pressure. A curve for air with gasoline has been included in Fig. II also. This has been added for the purpose of serving as a connecting link between later experimental work and this theoretical conception. True, the theory here presented will not assure quantitative accuracy, but it is valuable as a means of determining tendencies in atomization.

Experimental Work; Correlation to Theory

The purpose of the experiments was to verify the calculated tendencies in atomization, to find the lowest gas velocity for a good spray and to determine the size and shape of an effective nozzle tip as well as its maximum capacity.

A Venturi for test purposes was built having a throat of 1/2-inch diameter and length constructed within a 2-inch pipe with entrance and exit cones of 25 and 7 degree angles respectively. Connections furnishing upstream and throat pressures were provided. A mercury as well as water manometer was used to measure differentials indicating the velocity. The Venturi exit was left open to facilitate observation. Compressed air, moisture free, was used in place of gas and gasoline fed from a burette in place of odorant oil.

The characteristics of various nozzle tips were first studied. All tips were made up of brass tubing 0.03 inches I.D. and 0.0625 inches O.D. soldered to a more substantial brass tube 3/16-inch O. D. swedged streamline at the end to eliminate turbulence.

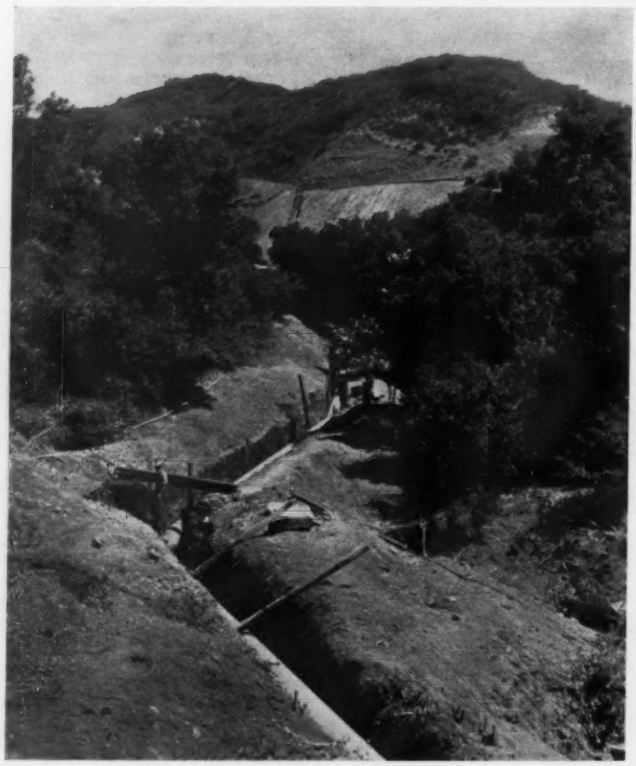
The conventional overshot type, Fig. IV (a) gave poor results. Part of the liquid was deflected against the side of the Venturi where, of course, atomization was incomplete due both to adhesion and diminished gas velocity. This slopping was undoubtedly due to the liquid being attracted to the zone of rarefaction immediately behind the nozzle tip.

An arrangement as in Fig. IV (b) was least successful. Intermittent surging overloaded the apparatus and detracted from effective atomization.

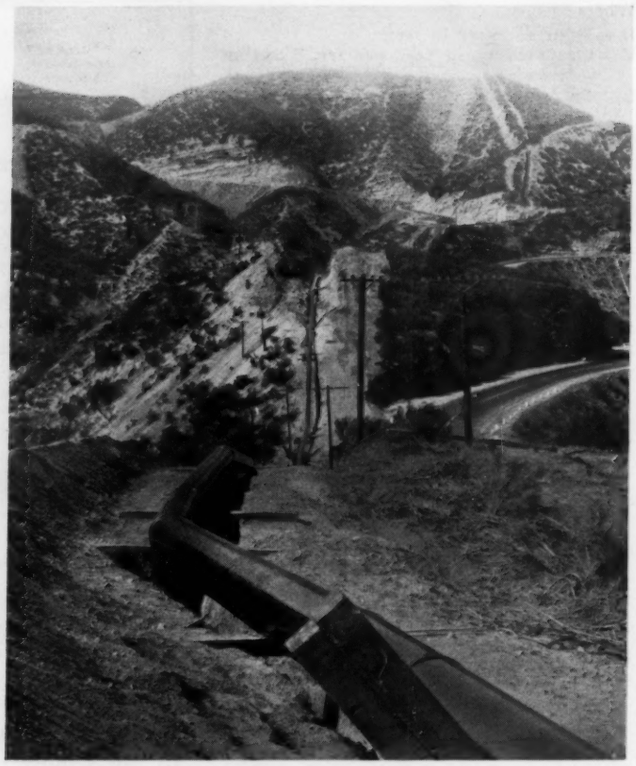
The nozzle tip in Fig. IV (c) was a solution to the problem; it atomized well and maintained a constant rate. Its efficacy was probably due to three reasons particularly: The shear across the top prohibited the adhesion of the liquid to the tip, the termination of the tip in a point was conducive to fine atomization, and the tilt discouraged the liquid from gathering and flowing down the tip body against the air flow.

Next the lowest air velocity effecting a permissible spray was found. This value was to be considered a very minimum limit for subsequent odorizer design since higher average velocities were contemplated. The lower limit seemed to be in the neighborhood

(Continued on Page 50)



Hand trenching was necessary at many points, due to the impossibility of getting ordinary power equipment onto the rugged right of way.



The above view is an excellent sample of the terrain traversed by some of the Southern California Gas Company's 1930 transmission line projects.

Pipelining Where *the* Going Is *Rough* . . . . . .

By H. P. GEORGE

General Superintendent, Natural Gas Production and Transmission, Southern California Gas Company

H. P. George

IN its 1930 construction program the Southern California Gas Co. has encountered pipelining conditions which are distinctly out of the ordinary line of experience. Illustrations with this feature indicate at a glance the type of terrain which has faced the construction crews. H. P. George in the following pages deals with some of the methods adopted for pushing through this unusual gas line project.—*Editor.*

A MAJOR project of the Southern California Gas Company to increase its transmission facilities to the Los Angeles metropolitan area contemplates the construction of a large diameter pipe line from Kettleman Hills to Los Angeles. During 1930 approximately 72 miles of line was constructed on this project.

In this 72 miles of line route were several stretches over the roughest of mountain territory, presenting obstacles which taxed the construction crews to the limit. A notable example of this mountainous terrain traversed by the line was the 40-mile section along the Ridge Route to San Joaquin Valley.

Since the completion of this project was not planned as part of the 1930 construction program the portions that were installed in 1930 were divided in sections for convenience and located where the maximum benefit would be derived from the new construction.

The project was handled in five independent sections, comprising 10 miles of 26-inch O.D. pipe (9/32-inch walls); 18 miles of 22-inch O.D. pipe (9/32-inch walls); 13 miles of 22-inch O.D. pipe (9/32-inch walls); 24.5 miles of 22-inch pipe (5/16-inch walls); and 5½ miles of 22-inch O.D. and 1 mile of 20-inch pipe (5/16-inch walls).

Three miles of the 18-mile 22-inch section crossing portions of the Newhall Mountains were exceedingly rough. The terrain on the 13-mile 22-inch section on the Ridge is also exceptionally rugged in character.

Pipe

"Smithwelded" pipe furnished by the A. O. Smith Corporation of Milwaukee, Wisconsin, in 40-foot lengths, with bell ends and center rings for electric welding, was used.

All pipe had a carbon content of .20-.30 and the specifications called for a minimum tensile strength of 60,000 pounds per square inch.

The pipe was shipped all rail to convenient points.

Preparing Right of Way

On approximately 22 miles on the various sections the terrain traversed was extremely rough and rugged, and much preliminary work was necessary before any actual construction on the pipe line proper could start. Due to the steep side slope along the route of the line on these portions it was necessary to cut a grade upon which to move power equipment used in the construction of the line.

It was found that the most suitable grade was one at least 20 feet in width. While this may seem excessive it is the minimum width that will permit the use of the equipment needed to handle pipe of this size and weight and at the same time permit the movement of equipment to other sections of the work. Where rock formation or exceptionally steep slopes were encountered it was thought advisable to reduce the width of this grade, but invariably this resulted in delays whenever equipment was used. All grading was done with 1-yard gasoline driven shovels.

To suggest the magnitude of this necessary preliminary work, it may be noted that at one time six gasoline driven shovels and six 60-horsepower caterpillars equipped with bulldozer blades were in use on this work.

On the other portions of the route the preliminary work consisted mainly of running a blade over the right of way to level it off sufficiently for the ditching equipment.

The speed with which the construction of the pipe line progressed is evidence that the construction of a grade at least 20 feet wide ahead of the actual construction work is well worth while.

Hauling and Stringing of Pipe

The pipe was shipped all rail to convenient locations from which it was hauled on trucks to the job. Cranes were used to unload the cars and also for unloading the trucks on the job wherever possible. However, in certain portions it was impossible to get cranes for unloading along the right of way, and pipe for these portions was stack piled as close as possible and strung with lighter trucks. Large second hand truck tires were used as cushions when pipe was dumped off. In portions too steep for trucks the pipe was snaked in with caterpillars.

Ditching

The ditching was done by machine as far as possible, making a trench 10 inches wider than the outside diameter of the pipe. The preliminary grading work made it possible to machine trench many miles that otherwise could only have been done by hand.

Lining Pipe

Standard methods of lining were employed on most of the work, but in rough portions a number of small line up crews were used, with lighter equipment, usually 60-horsepower caterpillars equipped with side booms. Where this equipment was working on the grade prepared by the shovels it was often necessary to level off the spoil bank, left after ditching, for the equipment to work on. This was done with 60-horsepower caterpillars with backfiller blades.

Angles

Due to the character of the country in some sections, and to the excessive number of substructures encountered at other points, many angles, both horizontal and vertical, were necessary. To form these, each end was cut at an angle equal to one-half of the total required angle. This produces an ellipse and provides sufficient material to permit forming into a bell end similar to that on the regular lengths. This bell is made at right angles to the plane of the ellipse and is thus at an angle with the axis of the original section. The internal diameter of the bell on these angles is the same as that on the regular joints of 40-foot pipe, and if an angle was to be made at a point where it was impossible to make a double bell joint, the pipe was cut and inserted in the bell on the angle and a fillet weld made. These factory bends are made in 5-, 10-, 15- and 20-degree angles. This combination, together with the angle obtainable in the regular bell joints, makes it possible to secure any desired angle.

Smith expansion joints were also used in many cases to make angles.

Gasoline shovel preparing right of way

Unloading pipe from cars to truck

Ditcher working on finished grade

Lining pipe in a mountain section

Welding

The "Smithweld" process of electric welding was employed throughout and standard methods of field electric welding were used on the entire job. No unusual conditions were encountered in welding, except that due to the large number of angles and the steepness of the route a very large percentage of the joints were necessarily bell-hole welded. The transportation of generators was greatly facilitated in the rougher sections due to the construction of the grade prior to construction work.

Suspensions, Supports and Underground Crossings

Where the line crossed highways, dedicated streets, railroads, etc., underground crossings were made in accordance with the specifications of the companies or communities involved.

An overhead suspension was made where the 22-inch line along the Ridge crosses the California State Highway. This suspension is a combination pipe line and foot bridge

(Continued on Page 54)

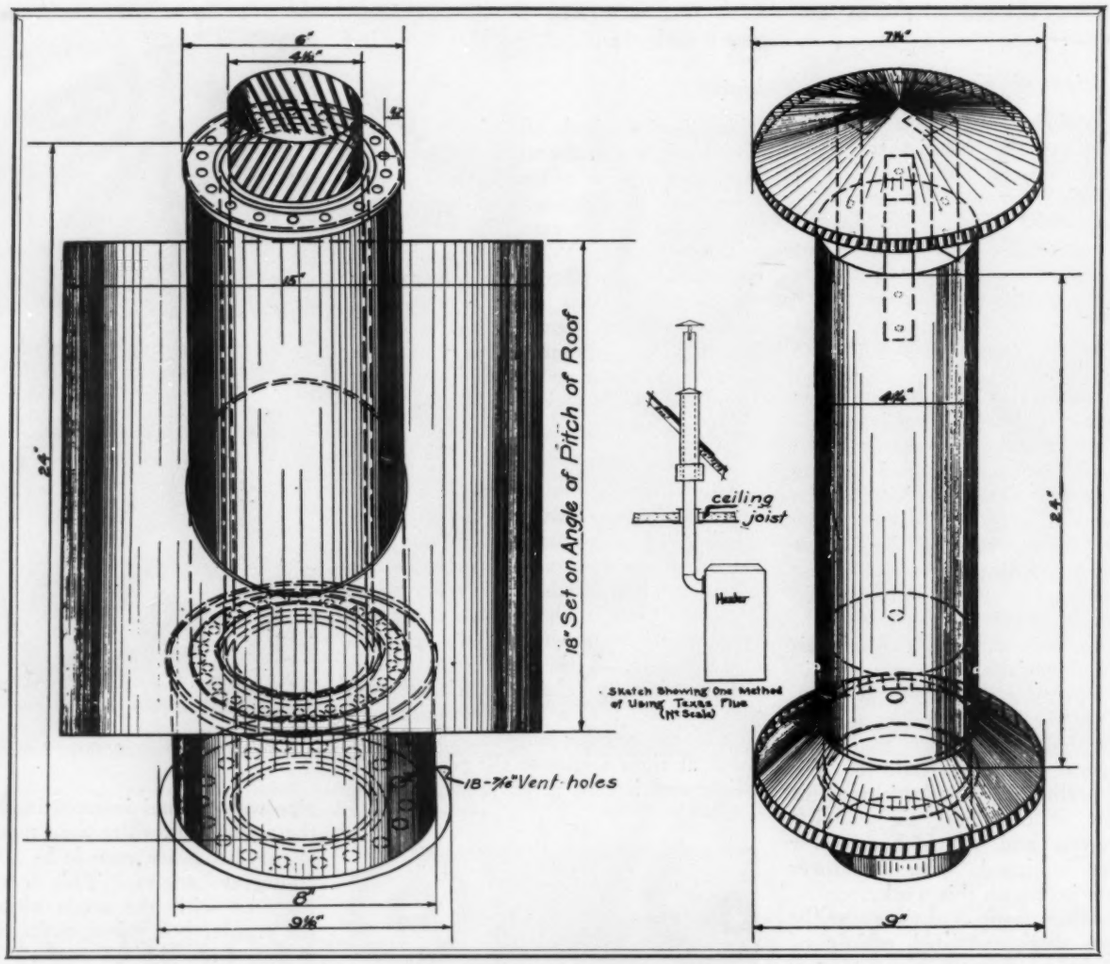

18" Set on Angle of Pitch of Roof
ceiling joist
Heater
Sketch Showing One Method of Using Texas Flue (1/4" Scale)
18-7/16" Vent holes

Fig. 1. Sketch showing detail of construction of the "Texas Flue".

Sold! 500 Circulating Heaters

By E. L. DUNAGAN

Commercial Manager
Oklahoma Natural Gas Corporation,
Tulsa, Oklahoma

E. L. Dunagan.

RECENT years have seen the development and introduction of several specialized gas heating appliances which have aided the gas industry in clinching this all-important element of the domestic load. For example, a number of factories are now turning out circulating gas heaters for domestic use, in large quantities. This type of fixture fills a great need in homes of the South and Mid-Western sections of the country, where "wall sweating" or water vapor conditions seem to be more prevalent. It also fills a large gap in the summer merchandising activities of the gas company, and it certainly accounts for a very substantial increase in the gas load. For a mid-summer special campaign it is hard to beat, as the writer can testify by the net results of last summer's selling campaign which started August 1, and closed September 1, during the hottest summer we have known in years. In view of the fact that this summer sale was conducted without any expense whatsoever for newspaper advertising or publicity, other than that of the salesmen's customer contacts, it was considered a great success, more than 500 circulating heaters being sold and installed before September 15. Two well known circulating heaters were selected for the sale and the salesmen were told of the sales plan several weeks in advance, which enabled them to get their prospects ready to buy during the sale.

The plan as used during this sale was a very simple one. It called for a payment of $2, the contract showing a 5 per cent price discount, and 12 monthly payments, the customer to begin making payments the following month, whether the heater was installed or not. If all payments up to December were made, the customer could make special arrangements with the credit department to have his payments reduced during the high gas bill months of December, January and February, provided payments during these months were not less than $1. It can be seen that the inducement to buy during August on this plan was a small down payment, the reduced payments during December, January and February and the 5 per cent discount.

Because of a tendency of the builders to construct inadequate flue connections,

(Continued on Page 62)

Sales Organization *for a* Group *of* Small Gas Properties

Employee Cooperation Is the Essential Element

By S. E. KERR

New Business Manager,
Community Natural Gas Company
*Dallas, Texas**

EMPLOYEE cooperation is the main problem in a company whose property consists of many small towns.

Ordinarily, except until quite recently, gas companies' properties consisted of a relatively few towns—and even those were of such size that they could easily support one salesman and generally more.

The matter of securing employee cooperation, then, was comparatively simple. It was easy to come into direct contact, almost daily, with all employees, and thus be able in a measure by repetition alone to get the cooperative idea instilled into their minds.

The matter of sales organization under such close and frequent contact was usually very simple—just a question of securing a few men who had ordinary ability, and day by day training them personally right on the job.

In the company with which I am connected it was an entirely different problem. With towns, the more distant of which are some 350 to 400 miles apart, and with some 50 to 60 offices where displays are maintained, it was not such an easy problem to attack.

When your larger towns at their peak winter business have somewhat less than 3,000 meters and only a very, very few of the 250 or more towns with even this large a number, you can begin to see the utter futility of attempting to handle the appliance sales with salesmen alone, and the urgent necessity of obtaining whole-hearted employee cooperation.

The securing of this cooperation at the outset was not such a simple matter. Most of the towns were not yet over their growing pains of the construction period. The agents in charge in most cases had been promoted from local foreman in charge of construction to agent. Complications were bound to arise in attempting to get the construction foremen, who still had many worries with their numerous extensions on their minds to become "merchandise minded."

In the first place they knew but little if anything about gas stoves, heaters, etc., and secondly, they had no time to learn.

Our first problem was to get the message over to them that with towns as small as those in which they had to operate, it was going to be imperative that each meter have just as many appliances behind it as was possible in order to keep the gross revenue sufficiently greater than the operating cost to justify the company in retaining their services.

This was not so easy at first, and in some cases it took some straight talk from company executives to convince the new agent of this fact. The majority of agents, however, saw the importance of having their lines loaded, and one by one joined the ranks. As they understood the situation better they sensed the need for regular salesmen in their territory.

In the meantime, to give our growth more impetus, and realizing that the number of self-action water heaters on our lines were comparatively few, a water heater crew was organized. At this time the number of salesmen on our properties consisted of some five or six men. These men were called in to our general office and three or four new and promising-looking men added. With the assistance of one of the water heater companies whose product we were selling, these men were given three days' intensive training and started out to make a straight house-to-house canvass—"cold turkey work," as it is sometimes called.

It was soon discovered that our towns were entirely too small to work a crew of eight men in at one time, and the crew was divided into two parts with a leader for each and a supervisor, the latter being furnished by the water heater company.

This double crew later became our only "school" for new salesmen, and every new salesman employed was immediately put on this crew. Later three range crews were organized by taking one or two older men from the original water heater crew, and making them the nucleus of a new group. Still later another water heater crew was organized along similar lines, making a total of three water heater crews and three range crews, totalling some 25 to 30 men working on our properties at one time.

As these crews worked through the different districts into which our system is divided, the agents and district superindendents—profiting by the direct contact with the different men in each group—selected the man whom they felt would best fit into their local organization and recommended this man to become their resident salesman. From this action you can see to what degree we practice cooperation in our company. For while the qualifications of the prospective salesmen are passed upon by the manager of the new business department, and the new men for sales work are employed by him, in nearly every case he becomes a resident salesman by recommendation and request of the superintendent of the district to which he is finally assigned. Since the district superintendent is held strictly and entirely responsible for the sales of appliances in his district we believe it only fair that he be given due consideration and his desires and recommendations be respected in selecting salesmen who are to become a part of the local organization of which he is the head.

By adhering to this practice as much as possible, we have been able thus far to build up employee cooperation to a gratifying extent, and to produce successful sales organization as well.

Sometimes, of course, we make a mistake under the foregoing procedure and must take the necessary steps to rectify it. When the district superintendent feels that a mistake of sales personnel has been made he takes the matter up with the manager of the new business department, and after due consideration the man is usually transferred to some other district into which it is felt that he will fit better, or if his case seems hopeless he is dropped from the organization.

(Continued on Page 52)

*Presented on the program of the First Southwest Natural Gas Sales Conference, held November 13-14, at Dallas, Texas.

Factors Effecting *a* Minimum Cost *in* Gas Pipe Lines

By W. R. KEPLER

A. O. Smith Corporation
Milwaukee, Wisconsin

PART II

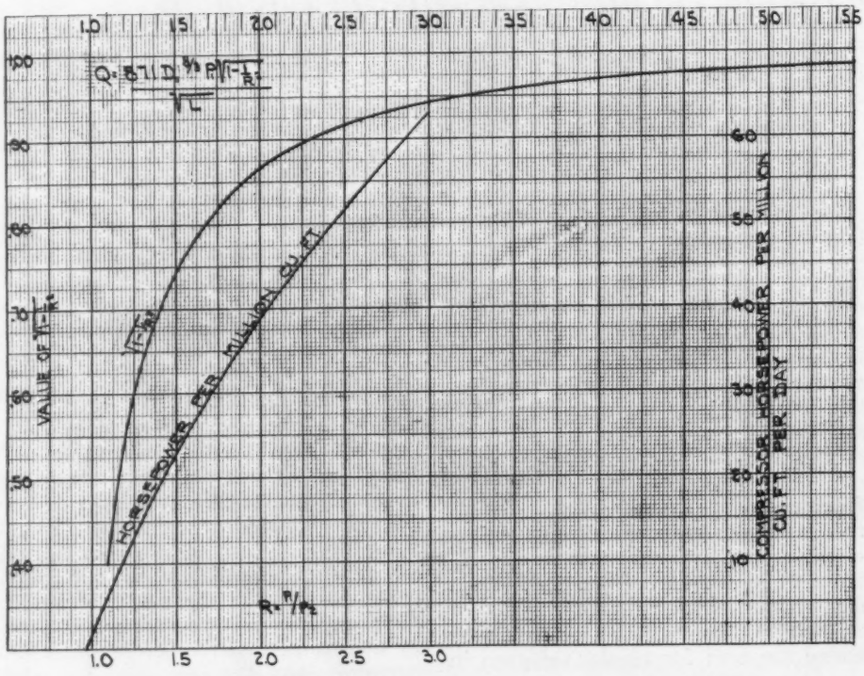


FIG. VII - VALUE OF $\sqrt{1-\frac{1}{R^2}}$ IN WEYMOUTH FORMULA AND COMPRESSOR HORSEPOWER PER MILLION CUBIC FEET OF GAS PER DAY FOR VARIOUS RATIOS R.

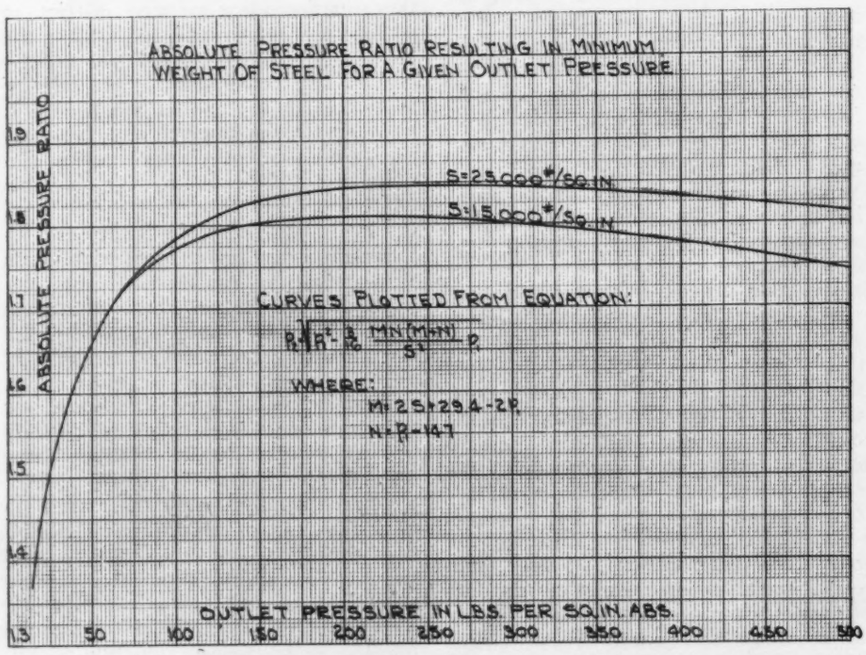


FIG. VIII - ABSOLUTE PRESSURE RATIO RESULTING IN MINIMUM WEIGHT OF STEEL FOR A GIVEN OUTLET PRESSURE, WHERE ROCK PRESSURE IS AVAILABLE.

W. R. Kepler

MR. Kepler's analysis of pipe line cost factors, presented before the American Gas Association Technical Section at the October convention, is concluded in the following pages. The first portion of the paper, as published in *Western Gas* for November, 1930, dealt with the conditions resulting in a minimum amount of steel for the pipe, and the best absolute pressure ratio where rock pressures only are used. Additional factors of cost which enter into the complete line are discussed in the section below.—*Editor.*

THE following give the basis upon which the comparative costs were made.

Cost of Steel: For making comparative figures on the cost of pipe lines, the steel has been taken to cost $100 per ton, including freight but not unloading, which makes a very convenient basis to use when the costs of steel and freight are anything other than $100. The stress has been taken at 15,000 pounds per square inch to correspond with the present day practice.

Cost of Laying the Line: The cost of laying a line is probably the most difficult item to estimate in making comparative figures on a gas line. Where the line extends through a flat or slightly rolling country and the ditch can be machine dug and backfilled, the cost might be two-thirds of the average cost per mile for laying a long distance pipe line, while if the line runs through a hilly country and hand ditching is necessary through considerable rock, the cost might be two or three times the average cost. However, on a long transmission line extending through flat or slightly rolling country and probably only part of it in an extremely hilly country, an

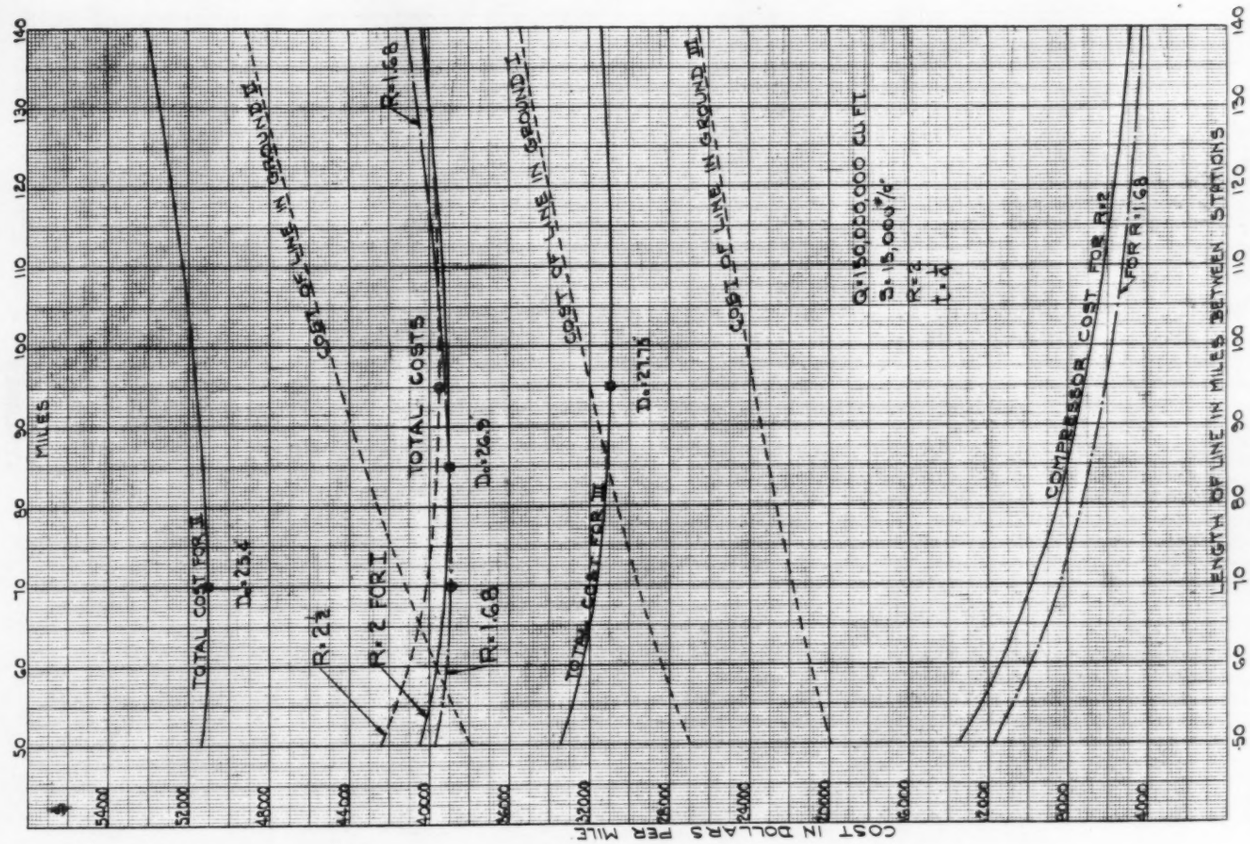


FIG. X - VARIATION OF LENGTH BETWEEN STATIONS DUE TO DIFFERENT LINE COST COMPARED TO SAME COMPRESSOR COST.

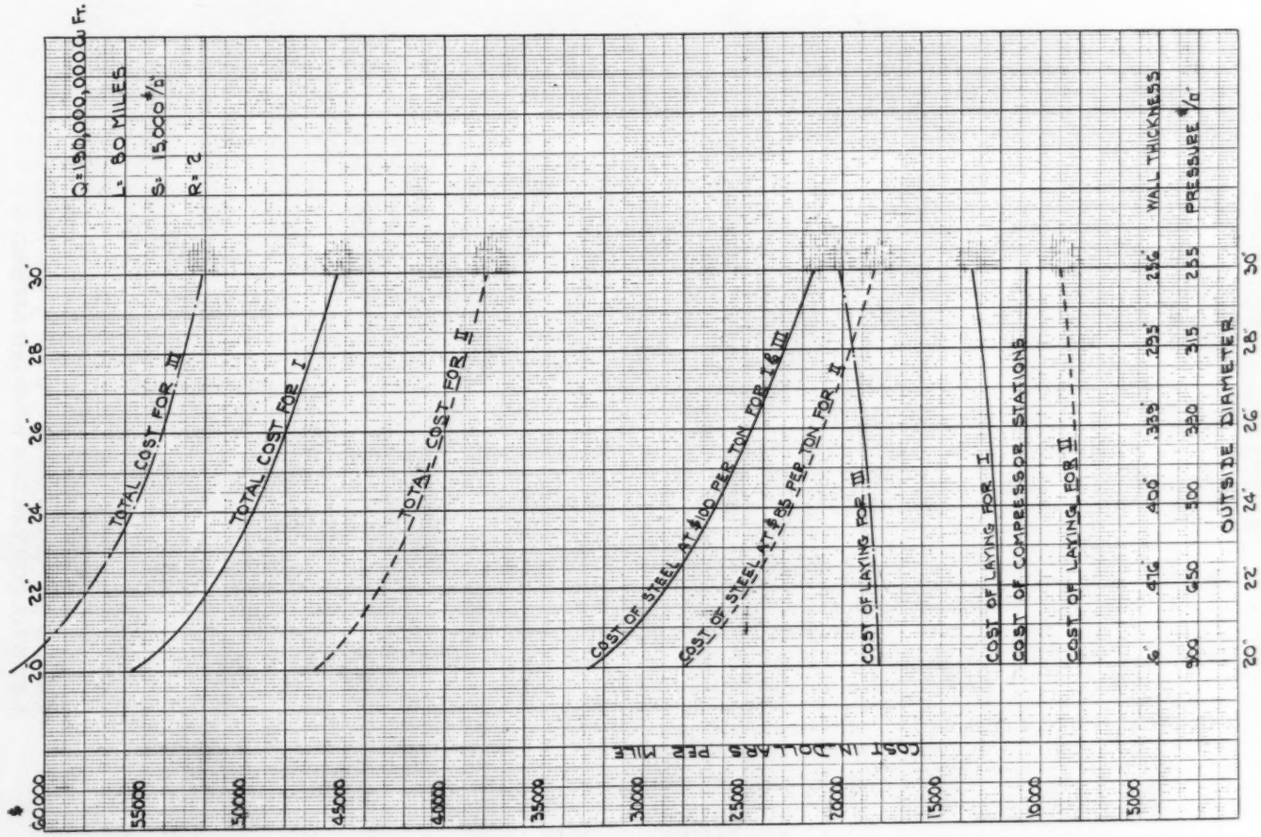

Q=190,000,000 Cu Ft.
L=80 MILES
S=15,000#/"
R=2
TOTAL COST FOR III
TOTAL COST FOR I
TOTAL COST FOR II
COST OF STEEL AT $100 PER TON FOR I & III
COST OF STEEL AT $85 PER TON FOR II
COST OF LAYING FOR III
COST OF LAYING FOR I
COST OF COMPRESSOR STATIONS
COST OF LAYING FOR II
OUTSIDE DIAMETER
WALL THICKNESS
PRESSURE #/"
COST IN DOLLARS PER MILE

FIG. IX - COMPARATIVE COST OF PIPE LINES TO CARRY 190 MILLION CUBIC FEET OF GAS PER DAY, USING VARIOUS DIAMETERS OF PIPE.

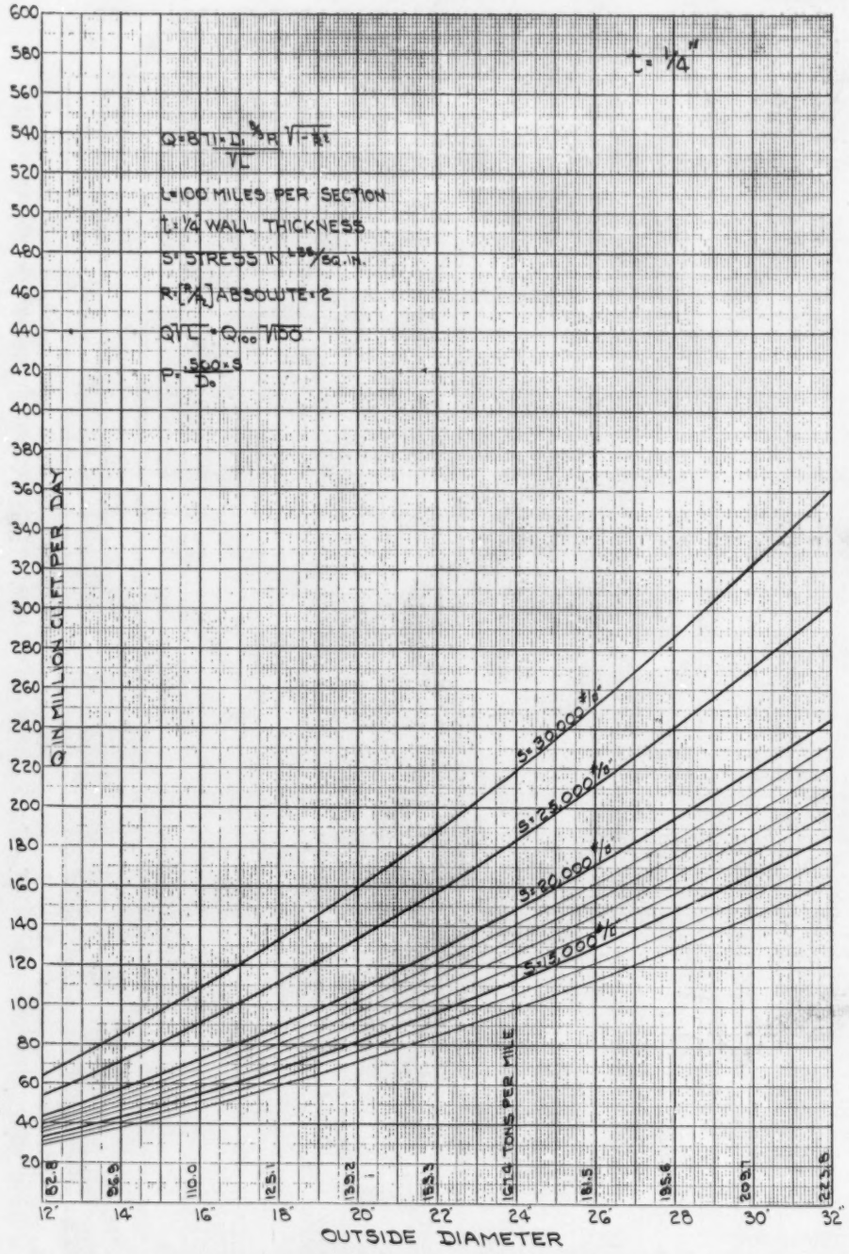


FIG. XI - CARRYING CAPACITY FOR 12" TO 32" DIAMETER PIPE WITH 1-4" WALL FOR VARIOUS WORKING STRESSES.

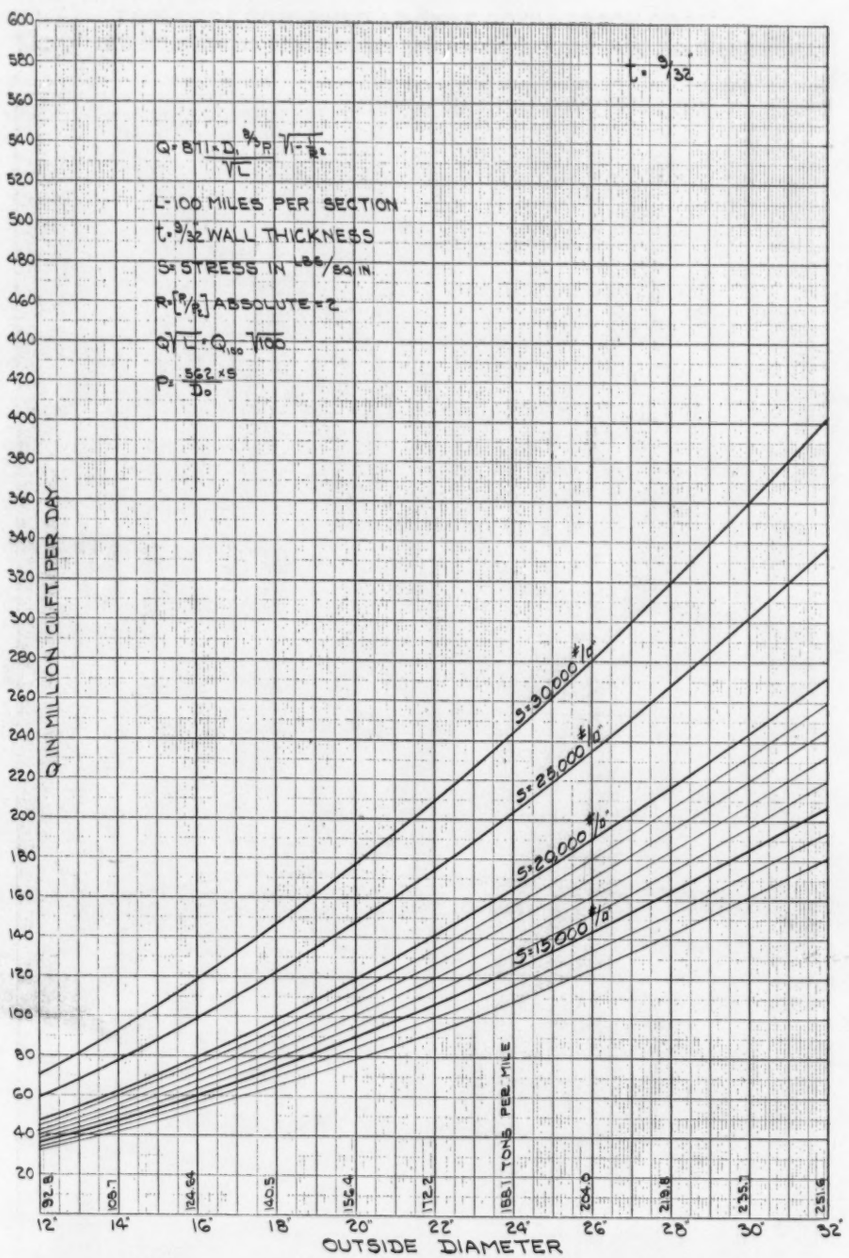


FIG. XII - QUANTITY PER DIAMETER FOR 9-32" WALL FOR VARIOUS STRESSES

average cost may be arrived at for comparative purposes and especially when comparing the costs of various sizes of pipe, say from 16 inches to 30 inches diameter.

For such a range of diameters there are certain items in the entire laying cost which would be practically the same per mile for any of these diameters, there are other items that would vary with the weight of the pipe, while other items would vary with the diameter of the pipe.

In arriving at a workable formula, we have taken such items as:

(1) Surveying, right of way, clearing, telephone lines, supervision, engineering, undistributed costs and a certain portion of ditching, painting, and cleaning which are constant.

(2) Unloading, hauling, aligning, placing and welding couplings, as dependent upon the weight.

(3) Ditching, paint, painting labor, backfilling and equipment as dependent upon the diameter.

With the above items considered, we have used the following formula to arrive at the cost per mile of laying various sizes of pipe:

(1) $3,000 (Same for any size of pipe.)

(2) $12 x the tons of steel per mile.

(3) $260 x the diameter of the pipe in inches.

The above setup for calculating the laying cost of a line per mile gives results comparable to several actual laying costs and checks with an estimate made by one of the large contractors experienced in this kind of work. It gives results which would probably be high for an average cost per mile of a long gas pipe line. There have been some lines laid recently where there was practically no difference in the cost per mile between 22-inch, 24-inch and 26-inch pipe and the cost per mile was somewhere around two-thirds of that which would be obtained by use of the formula stated above. This was probably due to the use of improved machinery.

We might expect that for a line where most of the work could be done by improved machinery, the cost would be about two-thirds or three-quarters of that given in the above formula, while through hilly and rocky sections the cost might be twice as much.

TABLE NO. I.

Daily Delivery Million cu. ft.	*Cost of Buildings and Accessories*	*Cost of Compressing Machinery per Installed H.P.*
50	$ 75,000	$75
75	125,000	75
100	170,000	75
125	215,000	75
150	265,000	70
175	325,000	70
200	385,000	70
225	440,000	70
250	500,000	60
275	560,000	60
300	615,000	60

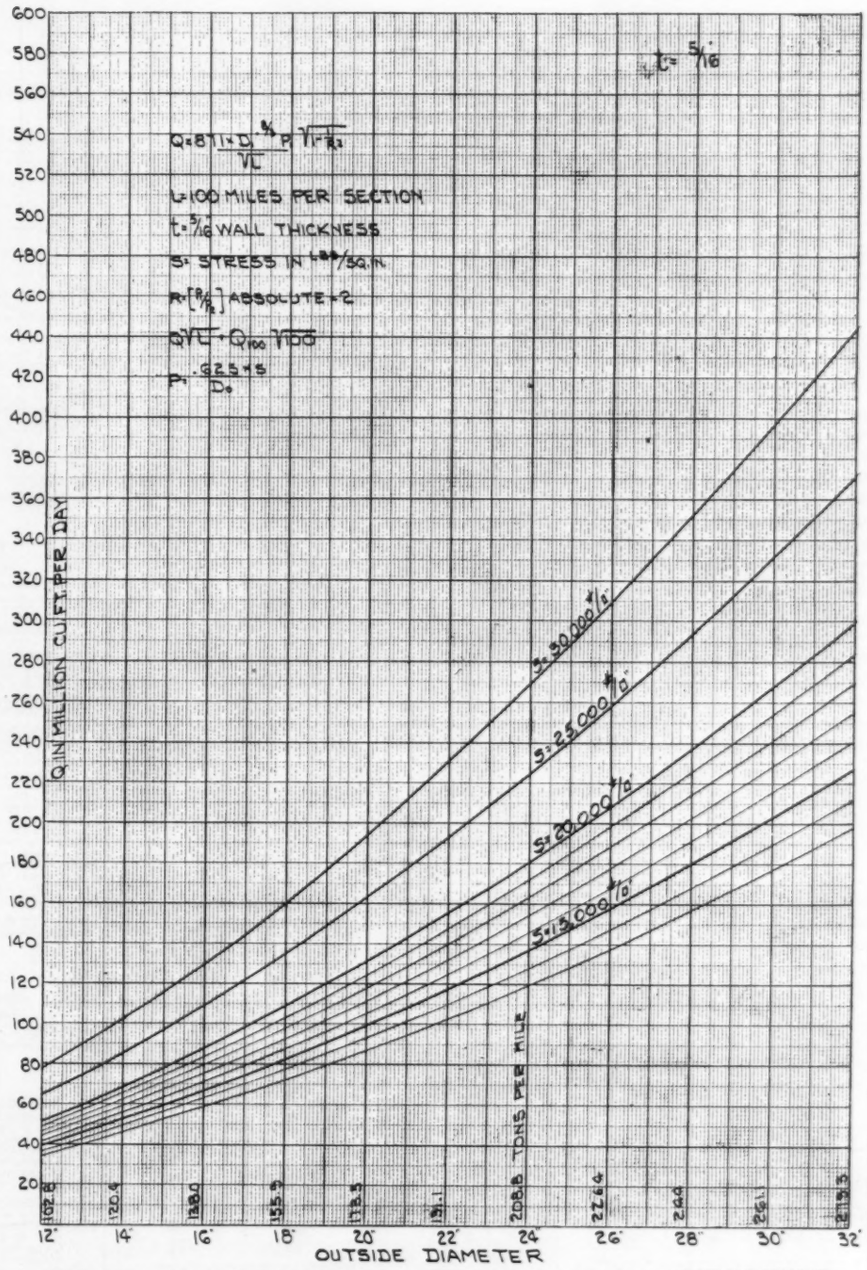
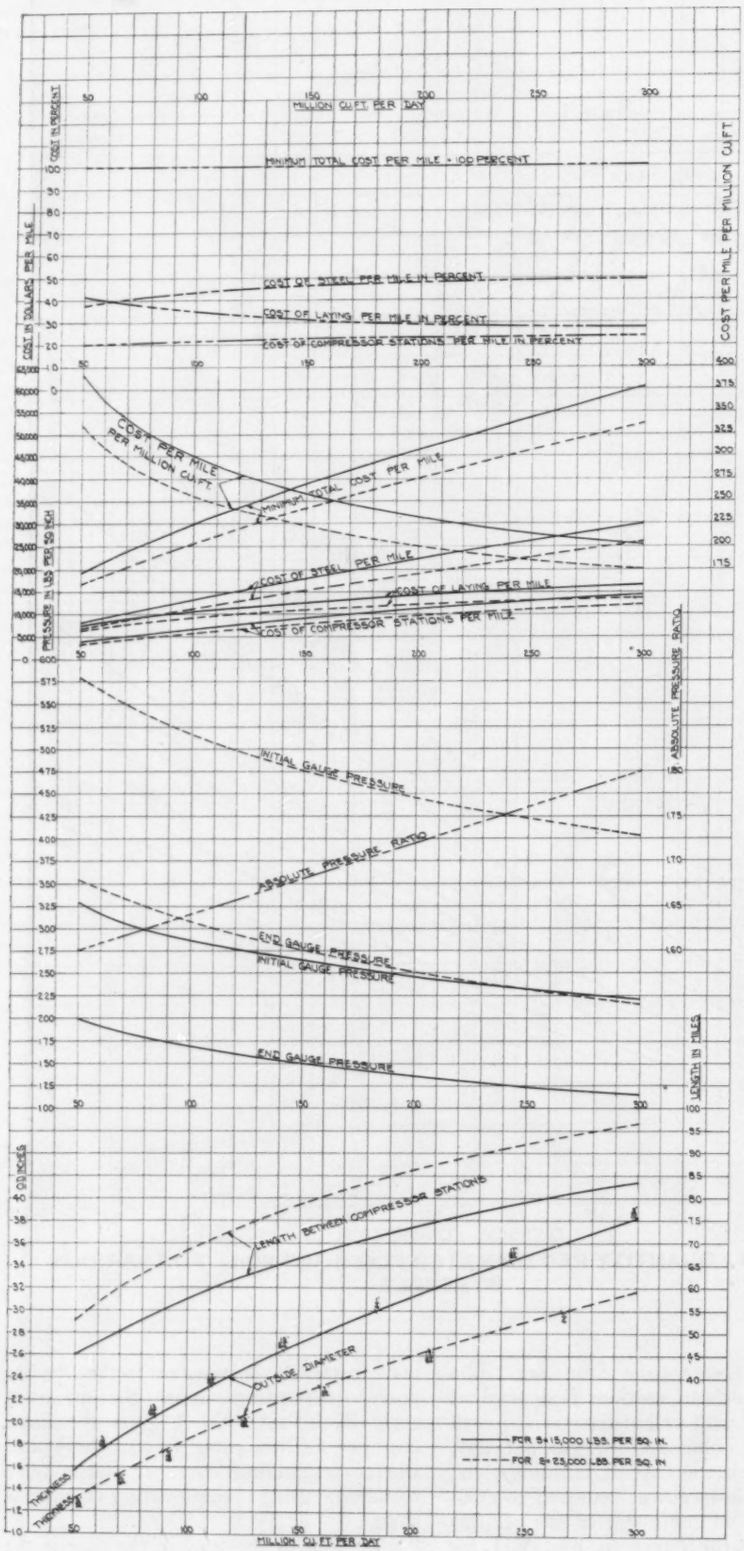
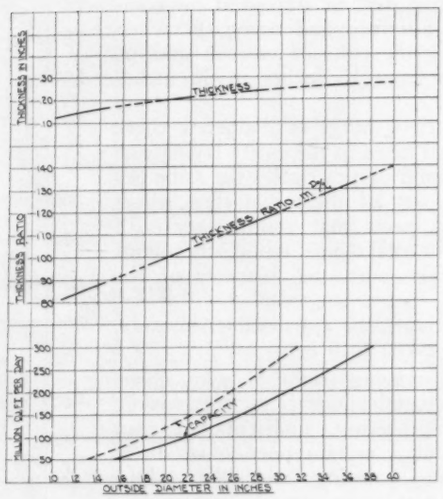


FIG. XIII - QUANTITY PER DIAMETER FOR 5-16" WALL FOR VARIOUS STRESSES

Cost of Compressor Stations: The cost of compressor stations is dependent upon the amount of horsepower required per million cubic feet of gas per day, together with the cost of buildings, etc. The actual horsepower required to compress a million cubic feet of gas per day is given on the curve in Fig. VII for various ratios of compression. The total compressor station cost has been divided into a cost covering the buildings, cooling coils, water towers, auxiliary machinery, valves, fittings, land, operators' houses, etc., and into a cost covering the compressor machinery based on the total horsepower per station at a given cost per installed horsepower; the horsepower depending upon the pressure ratio R. Table No. I gives the fixed cost per million cubic feet capacity and the corresponding cost per horsepower installed, using reciprocating compressors.

The cost of the steel in the pipe is the largest item in the total cost of the line. The effect on the total cost of the line when using thin wall large diameter pipe may be well illustrated by a concrete example. The pipe is to carry say 190 million cubic feet through a section of the line 80 miles between compressor stations, using pipes ranging in diameter


MILLION CU FT PER DAY
COST IN PERCENT
MINIMUM TOTAL COST PER MILE = 100 PERCENT
COST OF STEEL PER MILE IN PERCENT
COST OF LAYING PER MILE IN PERCENT
COST OF COMPRESSOR STATIONS PER MILE IN PERCENT
COST IN DOLLARS PER MILE
COST PER MILE PER MILLION CU FT
COST PER MILE PER MILLION CU FT
MINIMUM TOTAL COST PER MILE
COST OF STEEL PER MILE
COST OF LAYING PER MILE
COST OF COMPRESSOR STATIONS PER MILE
PRESSURE IN LBS PER SQ INCH
ABSOLUTE PRESSURE RATIO
INITIAL GAUGE PRESSURE
ABSOLUTE PRESSURE RATIO
END GAUGE PRESSURE
INITIAL GAUGE PRESSURE
END GAUGE PRESSURE
LENGTH IN MILES
OD INCHES
LENGTH BETWEEN COMPRESSOR STATIONS
OUTSIDE DIAMETER
THICKNESS
THICKNESS
FOR S=15,000 LBS PER SQ. IN.
FOR S=23,000 LBS PER SQ. IN
MILLION CU FT PER DAY



EXPLANATIONS

THIS CHART SHOWS THE CONDITIONS RESULTING IN MINIMUM TOTAL COST OF PIPE LINE INSTALLATIONS BASED ON AVERAGE COST FIGURES, AS GIVEN BELOW FOR TWO DIFFERENT STRESSES S=15,000 AND 23,000 LBS PER SQ. IN.

S=15,000 LBS PER SQ IN. S=23,000 LBS PER SQ IN. S=15,000 AND 23,000 LBS PER SQ IN

LET:

Q = CAPACITY IN CU FT PER DAY
D_o = OUTSIDE DIAMETER IN INCHES
t = THICKNESS OF PIPE WALL IN INCHES
m = D_o/t = THICKNESS RATIO
S = WORKING STRESS IN LBS PER SQ IN.
L = LENGTH BETWEEN COMPRESSOR STATIONS IN MILES

P_i = INITIAL GAUGE PRESSURE IN LBS. PER SQ IN.
P_e = END " " " " " "
P_1 = INITIAL ABSOLUTE " " " " "
P_2 = END " " " " " "
R = P_2/P_1 = ABSOLUTE RATIO
HP = ACTUAL HORSEPOWER REQUIRED PER MILLION CU FT PER DAY
E = ADIABATIC EFFICIENCY OF COMPRESSORS

TABLE I.

Q MILLIONS CU FT PER DAY	f $	c $
50	75	75,000
75	75	125,000
100	75	170,000
125	75	215,000
150	75 TO 265	265,000
175	75 TO 325	325,000
200	75 TO 385	385,000
225	75 TO 440	440,000
250	60 TO 500	500,000
275	60 TO 560	560,000
300	60 TO 615	615,000

a = COST OF STEEL DELIVERED IN $ PER TON
a = 400 WHEN S = 15,000 LBS PER SQ IN.
a = 415 WHEN S = 23,000 " " "

b = COST IN $ PER MILE INCLUDING ALL ITEMS WHICH ARE CONSTANT FOR ANY PIPE LINE.
b = $3,000

c = COST IN $ PER TON INCLUDING ALL ITEMS WHICH ARE PROPORTIONAL TO THE WEIGHT OF STEEL.
c = $12.

d = COST IN $ PER INCH DIAMETER PER MILE INCLUDING ALL ITEMS WHICH ARE PROPORTIONAL TO THE OUTSIDE DIAMETER.
d = $260

e = COST OF ONE COMPRESSOR STATION BUILDING & COMPRESSORS EXCLUDED AND ACCESSORIES IN $. IT IS E DEPENDENT ON Q AND TO BE TAKEN FROM TABLE I.

f = COST OF COMPRESSORS IN $ PER HORSEPOWER. IT IS f DEPENDENT ON Q AND TO BE TAKEN FROM TABLE I.

T = MINIMUM TOTAL COST IN $ PER MILE.
C_{STEEL} = COST OF STEEL IN $ PER MILE.
C_{LAYING} = COST OF LAYING IN $ PER MILE.
$C_{COMPR.}$ = COST OF COMPRESSOR STATIONS IN $ PER MILE.

THE FOLLOWING FORMULAE CAN BE DEVELOPED BY MEANS OF WHICH THE CONDITIONS RESULTING IN MINIMUM TOTAL COST CAN BE FOUND.

$$\frac{Hp\left[-R^{\frac{2}{5}}(.105-.105R^{\frac{3}{5}})\right]+.212R^{\frac{2}{5}}}{D_o^{\frac{5}{3}}} \quad (1)$$

$$\frac{15}{S}\left[e+f\frac{Q}{100}\right]\left(\frac{2.127}{D_o}\right)\left(K^{\frac{1}{5}}\right)\left(\frac{Q}{.0511}\right)^{\frac{1}{m-1}}\left(\frac{m}{.25+2.25m}\right)^{\frac{4m}{m-1}}\frac{R^{\frac{2}{5}}}{m^{\frac{1}{m-1}}}D_o^{-\frac{5}{3}}-56.4(Q+C)\frac{m-1}{mE}D_o+d \quad (2)$$

$$L=\left[\frac{Q^{\frac{1}{5}}}{(.0511)}\left(\frac{m}{m-1}\right)^{\frac{4}{5}}\left(\frac{m}{.25+2.25m}\right)^{\frac{4m}{5(m-1)}}\frac{R^{\frac{2}{5}}}{m^{\frac{1}{m-1}}}\right]^{\frac{15}{5}} \quad (3)$$

$$P_2=\frac{D_o}{m} \quad (4)$$

$$P_1=P_2+14.7 \quad (5)$$

$$R=\frac{P_2}{P_1} \quad (6)$$

$$R=R-14.7 \quad (7)$$

$$t=\frac{D_o}{m} \quad (8)$$

$$T=\underbrace{\left[28.2\frac{m-1}{mE}D_o^{\frac{3}{3}}\right]}_{C_{STEEL}}+\underbrace{\left[b+28.2c\frac{m-1}{mE}D_o^{\frac{2}{3}}+dD_o\right]}_{C_{LAYING}}+\underbrace{\left[e+f\left(\frac{Q}{100}HP\right)\frac{1}{L}\right]}_{C_{COMPR.}} \quad (9)$$

IN ORDER TO FIND THE CONDITIONS RESULTING IN MINIMUM TOTAL COST FOR A CERTAIN KNOWN CAPACITY Q AND GIVEN UNIT COST FIGURES THE ABOVE FORMULAE ARE TO BE USED AS EXPLAINED IN THE FOLLOWING:

A: INSERT Q AND THE CORRESPONDING VALUES OF c AND f INTO FORMULAE (1). WITH THESE VALUES INSERTED FORMULAE (1) MUST BE SATISFIED FOR CORRESPONDING VALUES OF R AND P_{2d}. CORRESPONDING VALUES OF R AND P_{2d} MAY BE FOUND FROM A GUARANTEE CHART FOR THE COMPRESSORS IN QUESTION. SOLVING FORMULAE (1) FOR CORRESPONDING VALUES OF R AND P_{2d} BY CUT AND TRY METHOD RESULTS IN THE MOST ECONOMICAL PRESSURE RATIO R.

B: INSERT THE CORRESPONDING VALUES OF Q, c, AND f; THE VALUES FOR Q, C AND d; THE WORKING STRESS S; AND THE CORRESPONDING VALUES OF R AND P_{2d} FOUND FROM FORMULAE (1) AS EXPLAINED UNDER A INTO FORMULAE (2) WITH THESE VALUES INSERTED FORMULAE (2) MUST BE SATISFIED FOR CORRESPONDING VALUES OF D_o AND m. - THE VALUE OF $m=\frac{D_o}{t}$ (OR THE VALUE OF t) DEPENDS ON THE DIAMETER OF THE PIPE AND HAS TO BE ASSUMED ACCORDING TO TECHNICAL CONDITIONS. IN THE CHART m IS ASSUMED TO BE A LINEAR FUNCTION OF D_o AS SHOWN IN THE UPPER RIGHT CORNER OF THE CHART TOGETHER WITH THE CORRESPONDING THICKNESS. IT IS EVIDENT THAT m (OR t) CAN BE ASSUMED TO BE ANY FUNCTION OF D_o. HOWEVER INVESTIGATIONS SHOW THAT SMALL THICKNESSES CORRESPONDING TO LARGE THICKNESS RATIOS RESULT IN GREATER ECONOMY. - SOLVING FORMULAE (2) FOR CORRESPONDING VALUES OF D_o AND m BY CUT AND TRY METHOD RESULTS IN THE MOST ECONOMICAL OUTSIDE DIAMETER D_o.

C: INSERTING Q AND THE VALUES OF R, D_o AND m AS FOUND BY USING FORMULAE (1) AND (2) AS EXPLAINED UNDER A AND B IN FORMULAE (3) RESULTS IN THE MOST ECONOMICAL LENGTH BETWEEN THE COMPRESSOR STATIONS.

D: THE MOST ECONOMICAL GAUGE AND ABSOLUTE PRESSURES CAN BE FOUND FROM FORMULAE (4) (5) (6) AND (7) AND THE THICKNESS FROM FORMULAE (8)

E: THE MINIMUM TOTAL COST PER MILE AND THE COST OF STEEL, LAYING AND COMPRESSOR STATIONS PER MILE CAN BE FOUND FROM FORMULAE (9)

NOTE.

THE VALUES OF THE COST FIGURES a, b, C, d, e AND f AS GIVEN ABOVE ARE AVERAGE VALUES USED IN 1930.

A.O. SMITH CORPORATION
MILWAUKEE, WISCONSIN.

MAY 1930
HERMANN GREGERSEN

FIG. XIV—CONDITIONS RESULTING IN A MINIMUM TOTAL COST OF GAS PIPE LINE INSTALLATIONS.

from 20 inches to 30 inches. The cost of the steel, cost of compressor stations and cost of laying is based upon the data given above for these various items. Fig. IX shows the cost for such a setup. For Case I the cost of steel is taken at $100 and the cost of laying as determined by the regular formula. The cost of the steel for a 20-inch line is $32,800 per mile, while for a 30-inch line it is only $21,500 per mile. The cost of the compressor stations would remain the same for any size of pipe while the laying cost would increase due to the larger diameters, but on account of the tons per mile being so much less, the laying cost increases only slightly with the increase in diameter. The total cost for Case II is based on a laying cost of two-thirds of that taken for Case I and the cost of steel at $85 per ton, while the total cost for Case III is based on a laying cost 50 per cent higher than Case I. All three conditions show a decided saving in favor of thin wall large diameter pipes.

Again referring to the curves and formula on Fig. VII, it will be noted that where compressors are used the full quantity carried by the line increases very gradually for a ratio above 2, while the horsepower per million cubic feet required by the compressor units increases rapidly from 39 H. P. for a ratio of 2, to 52 H. P. for a ratio of 2.5. If a ratio much below 1.5 is used, the quantity carried using a given diameter and pressure is materially reduced. It might be expected that the most economical balance would be obtained somewhere below a ratio of 2. It has worked out in actual practice that the best pressure ratio is between 1.6 and 2 for the full capacity of the line. Curves in Fig. I show the total cost of a line which would carry 150 million cubic feet with the compressor station spacing varying from 50 to 130 miles. The total cost for Case I having a compression ratio of 2 is practically the same as the total cost where the ratio is 1.68. Where the compression ratio is 2.5 the total cost is somewhat higher than for either ratio of 2 or 1.68. This indicates that, when taking into consideration the cost of the line, the most economical ratio of the discharge pressure to the intake pressure of the compressor units (or compression ratio) is slightly below 2.

The proper distance between compressor stations resulting in the total minimum cost is dependent on the relative cost per mile of compressor stations and the sum of the steel and laying costs per mile. With a fixed cost of compressor stations and the cost of the line per mile relatively high, it would be expected that the compressor stations for a given pressure ratio would be closer together than if the cost of the line per mile were relatively low. This is also illustrated in Fig. X.

TABLE NO. 2

Q=150,000,000 cu. ft. per day L=600 Miles
R=2, t=¼ inch, Stress about 15,000 pounds.
Total Cost of One Line Compressor Station $675,000.00

Number of Sections assumed	9	8	7		6
Miles between Stations	67	75	85.5	85.5	100
Million cubic feet for a 100 Mile length	123	130	138	138	150
Diameter of Pipe taken from Curves	26"	26"	26"	28"	28"
Stress	14,300	15,000	16,400	14,000	15,350
Tons of Steel per Mile	181.5	181.5	181.5	195.6	195.6
Laying Costs					
Fixed Items	$3,000	$3,000	$3,000	$3,000	$3,000
$12.00 x Tons	2,180	2,180	2,180	2,350	2,350
$260.00 x D	6,750	6,750	6,750	7,300	7,300
Total Laying Cost per Mile	$11,930	$11,930	$11,930	$12,650	$12,650
Cost of Pipe per Mile at $100.00 per Ton	18,150	18,150	18,150	19,560	19,560
Compressor Cost per Mile	10,100	9,000	7,900	7,900	6,750
Total Cost per Mile	$40,180	$39,080	$37,980	$40,110	$38,960

The cost for Case I is based on the steel in the pipe at $100 per ton delivered, and the laying cost as per the regular formula. For Case II the laying cost is double that of Case I and the cost of the steel the same as for Case I. For Case III the laying cost is taken as one-half of that for Case I and the cost of the steel at $90 per ton, the compressor costs per mile remaining the same in all three cases. The length between stations at the point of minimum total cost is 80 miles for Case I for the average condition, 70 miles for Case II where the cost of the line is high relative to the cost per mile of compressor stations, and 95 miles for Case III where the cost of the line per mile is relatively low compared to the compressor station cost per mile. It will also be noted that the spacing could have been changed over quite a range without materially affecting the total cost per mile. The fact that the length between stations can be varied over quite a number of miles works out well in practice in that the station location can be chosen where the site is best reached for hauling in large machinery, where ample water supply is available, etc.

The station spacing has been figured to obtain the minimum total cost of the line based on the maximum ultimate capacity. For the first few years or until the load is fully built up, less compressor stations, say one-half the number figured for the full capacity of the line, may be used. Also less compressors per station may be installed to reduce the initial investment. As the demand increases, the capacity of the line may be brought up to normal by installing the full number of compressor stations.

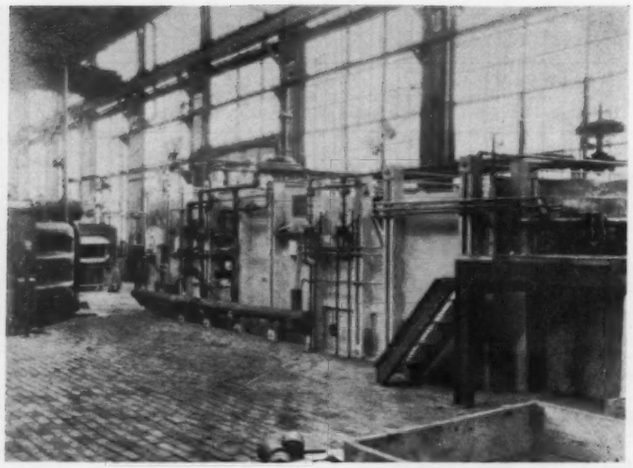
The costs have been figured for just a portion of a long transmission line and have considered only line compressor stations. The cost of the section of line near the field stations would be a minimum by using thin wall, large diameter pipes. Also, the horsepower necessary in the field compressor stations would be a minimum on account of the low pressures carried in the line, especially where there is a low rock pressure. As the line goes farther from the source of supply, some gas will be used by the compressors and some taken off for desirable markets along the way which would result in a different quantity to be transmitted.

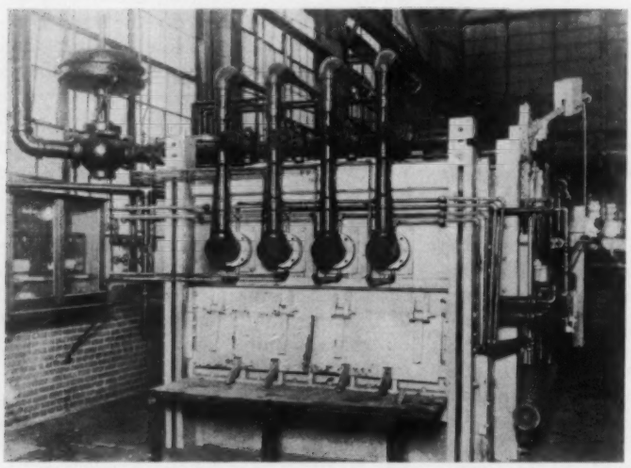
The design of a line as discussed in this article has been based on the assumption that the maximum quantity to be carried has been fixed. The selection of that maximum capacity must be made by those familiar with the load and market conditions.

Operating Cost: In Fig. IX the total cost per mile using a 28-inch diameter pipe to carry 190 million cubic feet is $46,500. The maintenance, taxes, interest and amortization would amount to about 14 per cent of the initial investment, or $6,510. With the total operating cost of the compressor stations per year taken as $8,000 per station plus $9.50 per horsepower per station, the total operating cost for the compressor station for an 80-mile section would be $78,300 or $980 per mile. With the cost of the management, overhead and maintaining the line taken at $500 per mile, the total operating cost and cost of operation of compressor stations would be $1,480 per mile. This cost would be the same whether a 20-inch or 30-inch diameter pipe were used, as it depends chiefly on the quantity for which the line is designed. The yearly fixed cost of 14 per cent on the initial investment would vary with the initial cost for the different diameters of the pipe and would naturally decrease as the first cost decreases with the use of larger diameters.

The fixed yearly cost is so much larger than the operating cost of the line or compressor stations that a minimum total yearly expense results from a minimum initial investment, and this in turn from the use of thin wall, large diameter pipes.

(Continued on Page 62)





ILLUSTRATIONS:

The two views at the left show a continuous, pusher type, gas-fired billet furnace for heating steel to a forging temperature (about 2300°F).

UPPER:
Charging end. Note upsetter and normalizing furnace at extreme left.

LOWER:
Discharge end showing burner equipment.

MODERNIZED FORGING

By C. B. PHILLIPS
Vice-President, Surface Combustion Company

REDUCING the ancient art of forging to an exact science has been a long time coming, for it has been only recently that this subject has received the attention commensurate with its importance. From the time the raw material is received, until the forging is delivered to the machine shop, the problem is almost entirely one of metallurgy, involving heating for the forming operation, working under the hammers, and normalizing to relieve the strains set up.

One of the largest manufacturers of oil well supplies has recently installed equipment for the making of rotary tool joints, which is considered the most modern set-up of its kind in the world. The raw material worked consists of alloy steel bars which are first cut to the proper lengths in a lathe and at the same time, a hole is drilled for the porter bar which provides a means of handling this piece from the furnace to the upsetter.

The pieces are discharged from the cutting machine onto an apron type conveyor, which carries them to concrete storage pits at the charging end of the forging furnace. A jib crane, with motor and magnet, picks up the pieces as wanted and drops them onto the loading platform of the furnace, and they are pushed along through the furnace with a mechanical pusher. The upsetter, which is of massive construction, is located close to the discharge end of this furnace, and, as the hot billets come through, they are picked up with a porter bar, suspended from a jib crane, and swung directly into the upsetter.

The forgings are then put onto a cooling conveyor, some 40 feet in length, which operates in a pit below the floor. This conveyor discharges directly onto an elevator conveyor, some 20 feet long, which finally dumps the forgings into another concrete storage bin at the head of the normalizing furnace. This furnace is charged by crane and magnet, as was the forging furnace, and, when the normalized forgings are pushed out onto the unloading table at the discharge end, they are handled by crane into more concrete storage bins.

The furnaces used in this set-up were developed by the research department of the Surface Combustion Company, Toledo, Ohio, and this concern built them and put them into operation. They are fired with gas. The forging furnace is known as a continuous billet heating furnace and is of the double row type, using two pneumatic pushers. It is 24½ feet long, 6 feet wide and about 20 inches high from the skid rails to the spring line of the arch, internal dimensions.

Of brick construction, the whole is encased in steel plates and supported by buck stays. The walls are 13½ inches thick and consist of 9 inches of firebrick and 4½ inches of insulation. Low pressure gas is used and there are eight water cooled burners, of which two are located on each side close to the discharge and firing under the hearth, and the other four directly in the discharge end, firing along the arch and above the work.

The type of burners used give a fuel analysis of constant value, regardless of heat input, and without the necessity of a furnace operator to adjust the ratio of air to gas. This ratio is automatically maintained with inspirators and the burners are directed in such a manner that uniform heat is maintained throughout the mass. In this way it is possible to make the mixture slightly reducing, thereby eliminating any free oxygen from the interior of the furnace, thus cutting the formation of scale to a minimum.

The factor of heat distribution is important in order to control the rate of heat input to various parts of the billets. The use of gas as a fuel and a firing system which employs the principles of both radiation and convection, afford a heat distribution which can be approximated only with a fuel, depend-

(*Continued on Page 64*)

Peak Load Production Economies Through *the* Use *of* Butane

By J. A. HARRITT

Superintendent of Gas Production, San Diego Consolidated Gas and Electric Company

WHILE the word butane is, to a certain extent, a misnomer, it is commonly applied to the commercial mixtures of the various liquefied hydro-carbons obtained in the extraction of gasoline from natural gas.

These liquefied hydro-carbon mixtures contain various amounts of ethane, propane, isobutane, butane and pentane. The ethane and pentane, however, are highly undesirable in any fuel in which our industry is interested at the present time. In the rectifying process these are readily segregated, the ethane being returned to the gas and the pentane being used in the production of gasoline. Thus a clean cut mixture of propane, isobutane and butane can be supplied to the industry, and the amounts of the three ingredients can be varied at will to maintain practically any boiling point or vapor pressure required by varying climatic conditions.

There appears to be no question regarding a plentiful supply of this material for years to come, and the facility with which it can be converted to a commercial gas demands the attention of the gas industry, and incidentally that of any one interested in the marketing of other fuels or electric energy, where such is used as a source of heat or light.

The extremely low installation and operation costs of plants for the conversion of this material to a usable gas, either pure, with a B.t.u. content of about 3200 per cubic feet, or mixed with air to obtain any desired B.t.u. below that point, renders possible the serving of gas to communities formerly so small, or so isolated that gas service was impossible. Even with the present wide divergence between the prices charged for fuel oil and for these liquefied hydrocarbons, small oil gas plants, possibly up to 100,000 cubic feet daily, can profitably be supplanted by plants producting a butane-air gas of normal B.t.u. value. This is due to the fact that in small plants, the labor, upkeep, overheads, and fixed charges per unit of gas produced are so greatly in excess of similar charges in a larger plant, that the increased fuel cost in producing a butane-air gas will be more than counterbalanced by the saving in labor and miscellaneous expense.

As plants become larger and larger, the cost of fuel becomes more and more dominant in setting the cost of gas production. Hence, any fuel to supplant the present low priced oil used by the oil gas industry must, in a plant of any considerable size, be reduced far below that which we can hope for in the case of these hydro-carbon compounds.

RECOGNIZING the importance of butane for increasing production during peak loads, the Pacific Coast Gas Association has assigned a committee to this subject. The committee is headed by J. A. Harritt of the San Diego Consolidated Gas and Electric Co., with F. M. Cota of the same company, and C. H. Webber, of the Tucson Gas, Electric Light and Power Co., Tucson, Ariz., completing the membership.

J. A. Harritt

The preliminary report published in these pages was prepared for the Technical Section program of the Association at the November 21 meeting held in San Francisco. Tests conducted at San Diego, and references to the experience of oil gas plants at Tucson, Ariz., and El Centro, Calif., are contained in the report.—*Editor.*

It would be well for the gas industry and the producers of these materials to cooperate in a thorough study of the needs of the former, and the ability of the latter to supply those needs. Such a study would no doubt be of mutual benefit to both parties in promoting the use of the material, particularly, perhaps in the immediate future, by the smaller manufacturers of oil gas, in more remote locations.

Hereafter, the word butane will be used, for the sake of brevity, in its commonly accepted form, as designating any commercial mixture of the three desirable ingredients, propane, isobutane, and butane. The possibility of the cost of butane being lowered to a point where it can supplant fuel oil as a basic fuel for gas manufacture in any considerable volume, is very remote, and more particularly so where other manufacturing processes are already installed.

But even with the present high initial cost and excessive transportation charges, the use of butane to increase plant capacity over peak load seasons offers great possibilities to our industry, whether we are large or small manufacturers. A lean manufactured gas can be carburetted readily by the addition of butane vapors to any desired calorific power, the lean gas offering direct savings in fuel costs and increasing the capacity of generating units by increasing the gas per unit of fuel used. The carburetion in itself, is 100 per cent efficient. The Tucson Gas and Electric Light and Power Company of Tucson, Arizona, was this year faced with the problem of increasing plant capacity for the coming winter, in the face of the possible early advent of natural gas into that territory. The estimated cost of oil gas apparatus for the desired increase was $50,000. This apparatus would be required for a very small portion of the year, but would entail a constant carrying charge and upkeep expense.

After experimentation in the carburetting with butane vapors of a 400 B. t.u. gas to 500 B.t.u., their standard, they installed a carburetting system at a cost of about $3,000, or one-sixteenth of the cost of the proposed oil gas apparatus.

With oil at $2.52 per barrel and butane at about $0.10 per gallon the increased cost of gas is about $0.04 per M for a short period of the heavy load season.

The carrying charges on the $50,000 capital investment would be very considerably in excess of the total increased cost of gas during the year.

Tucson reports that the lowering of the calorific power 100 B.t.u. results in a saving of 1.5 gallons of oil per M, and requires the addition of 1 gallon of butane per M of finished gas; has increased the generating capacity 30 per cent; has created more satisfactory operating conditions by eliminating the production of tar, and the necessity of cleaning scrubbers, washers, offtakes, etc., with a consequent reduction in labor and miscel-

laneous expense, which in a plant of that size, will go far toward counterblancing the additional $0.04 fuel cost per M.

C. H. Webber, superintendent of the Tucson company's gas department, further reports that production of lampblack has decreased approximately 30 per cent. This furnishes a very interesting subject for further consideration as the lowering of the calorific power of oil gas has always heretofore resulted in an increase in the amount of lampblack produced, in direct ratio to the increase in the hydrogen content of the leaner gas, despite the efforts of the industry to convert it to carbon monoxide.

The average specific gravity of the 500 B.t.u. oil gas at Tucson is .34, while that of the lean gas is .29. The addition of one gallon of butane, or approximately 32 cubic feet of butane vapor per M, results in a gas of .35 specific gravity and 500 B.t.u.

The generators at Tucson are of the straight shot up-blast type.

A similar, smaller plant at El Centro, Calif., used this method for increasing production during the past winter, and while we are not as yet entirely conversant with the results obtained, they are believed to have been substantially parallel to the results obtained at Tucson.

A 10-day test was made at the San Diego plant last August, along somewhat the same lines, but with different objects in view, and on a different type of generator, viz, the Jones improved sets of 5,000,000 cubic feet daily capacity.

The primary object of this test was to determine the quality of gas which could be produced most economically by this type of apparatus, which appears from our experience during the test to be between 510 and 520 B.t.u., whereas the experience at Tucson points to increased economies obtainable far below that value.

The San Diego test with an average of 508.3 B.t.u. in the lean oil gas, and the addition of .44 gallons of butane or 14 cubic feet of butane vapor, resulted in an increased capacity of 10 per cent, per unit of oil used. The improved operating conditions indicated that the generators could safely and economically crack at least 10 per cent more oil than is normally considered a safe load, thus increasing the safe net yield by 21 per cent, with further reserve for short peaks. The increased cost of gas, based on fuel costs only, during the 10 days of experimental operation was $0.19 per M of finished gas of 550 B.t.u. This cost is based on a tentative quotation of 6 cents per gallon of butane.

Improved operating conditions, due principally to the decrease in tar produced, with a consequent decrease in congestion and miscellaneous labor and other expense incidental thereto, would partially balance the increased fuel costs, in an amount which could not be determined under short periods of operation.

The specific gravity of the finished gas averaged .47 as compared with oil gas at .48. The increased hydrogen in the lean gas more than counterbalanced the heavy butane vapors, which in the San Diego tests were of 1.85 specific gravity. The experience at San Diego has resulted in the contemplation of the installation of butane storage and carburetting equipment in 1931, whereby the plant capacity during the peak season will be increased by approximately 20 to 25 per cent.

The estimated cost of this installation is about one-tenth of that required for oil gas apparatus for the same increase and practically all of it is for storage of butane.

The saving in plant carrying charges will be about $13,500 annually, which is far in excess of the increased cost of a carburetted lean oil gas during peak loads, which might occur during the coming winter, or perhaps during the peak season of the next two or three years.

Tucson, El Centro and San Diego are the only oil gas plants, so far as we know, which have experimented with butane in connection with oil gas manufacture, and the method has been confined to the injection of the vapor into the lean oil gas.

The San Diego company in its recently acquired plant at Oceanside, is installing a butane-air gas apparatus to augment the supply of oil gas. This presents an entirely different problem, as the butane-air gas of 550 B.t.u. will be 1.15 specific gravity and therefore its admixture to the oil gas must be limited. A separate vapor line will be provided for the cold carburetion of lean oil gas, so that the system will be extremely flexible and further additional capacity will be obtained by the use of the combined methods, the carburetion of air and the carburetion of lean oil gas. This plant will be installed at about one-fifth the cost of oil gas apparatus of equal increase, but will be of twice the capacity of the present oil gas plant, if operated continuously.

The total cost of the butane-air gas will be about 60 per cent of the present cost of oil gas, and the fuel cost of carburetted oil gas will be about $0.02 per M above present costs. It is very probable that in this plant, the increased capacity due to butane will result in lower costs of production than are at present obtained with straight oil gas.

Conclusion

The study of this subject, so far as it has progressed, clearly indicates that for peak load conditions, butane is admirably adapted to the needs of the oil gas industry.

Carburetion apparatus can be installed at an insignificant cost, of sufficient capacity to enrich large volumes of lean gas.

Storage capacity for butane is the only real item of expense and must be governed by the amounts required and the reliability of transportation.

Savings in the basic fuel in producing a lean gas, and the many economies obtainable elsewhere in the plant operation under this method, partially at least, counterbalance the apparent increase in fuel costs.

From 20 to 30 per cent increased capacity is readily obtainable with an initial investment of approximately 10 per cent of that required for oil gas apparatus.

Increased fuel costs will vary greatly according to size and location of plant, degree of carburetion desired, comparative costs of the two fuels and many local contributing factors.

It is probably safe to assume that the maximum range, in the oil gas area, has been reached at Tucson, with an increased fuel cost of $0.04 per M.

With that figure as the probable maximum increase in cost, for a few weeks per year, it is apparent that our industry should seriously consider butane as a solution of the vexatious peak load problem, even at the present unequable costs, and attempt to reduce these costs by the increased use of butane, until it becomes not only a substitute fuel for peak loads, but a base fuel for our small plants.

ODORIZATION OF GREAT FALLS GAS BEGUN ON NOVEMBER 3

The Great Falls Gas Co., Great Falls, Mont., started the odorization of natural gas on November 3. The substance used is Calodorant, which is being used successfully in several other cities where natural gas is distributed. It is placed in a 30-gallon tank with equalizing valves and then carried into the mains through a sight-teed valve where it drops into a special screen device inside the pipe, which causes it to spray and mix with the gas. About 2½ gallons per million cubic feet of gas is required.

The odorization of Great Falls gas is being done by sections. Newspapers are carrying advertisements announcing when each section may expect the odorized gas. The public is encouraged to report any leaks immediately and a crew of service men is being maintained to give customers repair service.

NATURAL GAS DEPARTMENT IS SUBJECT OF CONFERENCE

Preliminary arrangements for the annual convention of the Natural Gas Department, American Gas Association, to be held in Memphis next May, were made by E. J. Stephany, secretary, during conferences in the convention city November 24-26.

Tentative plans for the program were completed during Mr. Stephany's visit, exact dates for the convention to be announced later.

PACIFIC COAST GAS ASSOCIATION

447 Sutter Street, San Francisco, California

A Department Conducted by Clifford Johnstone, Managing Director

1931 Program Perfected at November Meeting

AT a very successful series of meetings held in San Francisco on November 20 and 21 the various sections of the Pacific Coast Gas Association organized their forces under the leadership of President R. E. Fisher, for another year of fact-finding and accomplishment in behalf of the gas industry. The first day was devoted to meetings of various special committees, among which were the Program Committee, the Gas Engineers Handbook Committee, the Women's Committee and the Board of Directors. On the morning of the second day each of the five sections of the Association held organization conferences at the Fairmont Hotel, followed by a luncheon attended by about 130 members of all groups. Those attending the luncheon heard Don Gilman, vice-president of the National Broadcasting Company, describe the remarkable development of national and world-wide broadcasting, and Dr. Theodore J. Kreps, Professor of Business Statistics at Stanford University, discuss "New and Old Factors in the Business Situation." Dr. Kreps emphasized the importance of stabilized labor and complimented the public utility industry as being close to the ideal in this regard. Miss Helen Webster, who broadcasts a gas message every Wednesday over the Pacific Coast Network of the National Broadcasting Company, spoke very interestingly of her work and introduced Benny Walker, who took Little Benny for a trip through a dime museum, much to the amusement of his auditors.

The afternoon was devoted to a general session at which Frank Wills, engineer of production of the Pacific Gas and Electric Company, delivered a paper entitled, "A Method for Designing Atmospheric Burners, with its Application to the Conversion of Manufactured Gas Burners to Natural Gas."

Mr. Wills' paper is an important contribution to the literature of gas utilization and will be published in the near future. Following Mr. Wills, Frank K. Runyan, managing director of the Retail Furniture Association, discussed the merchandizing problem in an address entitled, "The Place of the Dealer in Gas Appliance Merchandizing." During the course of his address Mr. Runyon complimented the Pacific Gas and Electric Company upon the excellence of its dealer relations.

1931 Convention

The Board of Directors affirmed its tentative decision that the 1931 Convention will be held in the City of San Francisco. Accompanying the Convention will be an elaborate exhibition of gas appliances, this exhibit to be open to the public during the afternoons and evenings of convention week. The exhibit will be extensively advertised and a type of entertainment furnished which will attract attendance. Plans for the exhibit will be in charge of H. M. Crawford, general sales manager of the Pacific Gas and Electric Company, and chairman of the Association's Commercial Section. The convention program will be arranged so that there will be no conflict with the exhibit.

Other 1931 Meetings

There will be no general conference in Los Angeles this year, but instead each Section will hold a meeting of its own. The Technical Section will meet in Los Angeles the first week in March; the Accounting Section the last week in February; and the Commercial, and Publicity and Advertising Sections will hold a joint meeting in April. The Commercial Section will also hold a meeting in San Francisco during the progress of the Western Metals Congress which starts on February 16, and in which the Section is participating. The Commercial Section also plans a Spring meeting in the Northwest, and all Sections will participate in the Annual Convention of the Arizona Utilities Association in Phoenix which is scheduled late in April. The Annual Northwest Conference will be held this year in Tacoma, probably in June.

Public Relations Contests

Geo. L. Myers, chairman of the Public Relations Section, announced that the Essay Contest, Public Speaking Contest for men, and Stunts Night Contest would be under the general supervision of E. M. Seel, chairman of the Committee on Employees' Relations with the Public. Miss Alma Freeburg of the Natural Gas Properties, Inc., will act as Director of the Essay Contest, the subject for which will be "The Consumer is King." The topic picked for the men's Public Speaking Contest is "Government Ownership of Public Utilities," and for Stunts Night, "I am the Company." Public speakers will this year be allowed five minutes instead of the customary three minutes, and the use of notes will be permitted. The women's Public Speaking Contest will be supervised by Miss Clarita Scott, Chairman of the Women's Committee, the subject being "The Place of Women in the Public Utility Industry."

Women's Committee Meets to Plan Year's Activity

TWENTY-FIVE women of the gas industry met in the office of the Pacific Gas and Electric Co., Thursday, November 20, at the call of Miss Clarita Scott, chairman of the Women's Committee, to plan the year's activity of the committee. This conference was composed of representatives of the northern California companies. A similar conference will be held at Los Angeles on Thursday, December 11, at which time delegates from the various companies in the southern area will be the luncheon guests of the Women's Committee of the Los Angeles Gas and Electric Corp.

Announcement was made in the Women's Committee Bulletin issued November 10, of an offer by President Addison B. Day, of Los Angeles Gas and Electric Corp., of $50 in cash prizes to be awarded for the best lines of a playlet on any commercial or public relations phase of gas service. Each Women's Committee is entitled to submit one entry in this contest. The cash will be awarded in first and second prizes equally divided between authors

of plays and the committee to which they belong.

Organization of committees in the various companies is not yet complete.

The incomplete roster of the committees at the close of the San Francisco Conference is as follows:

Coast Counties Gas and Electric Company, Santa Cruz, Calif., Miss Alma Freeburg, Chairman.

San Diego Consolidated Gas & Electric Company, San Diego, Calif., Miss OrLynn McKoane, Chairman.

Southern Counties Gas Company, Los Angeles, Calif., Mrs. Katherine Rathbone, Chairman.

Arizona Edison Company, Bisbee, Ariz., Miss Wilma D. Jones, Chairman.

Santa Maria Gas Company, Santa Maria, Calif., Miss Rilla Parsons, Chairman.

Central Arizona Light & Power Company, Tucson, Ariz., Miss Gladys B. Price, Chairman.

San Joaquin Light and Power Corporation, Fresno, Calif., Miss Clyda Weems, Chairman.

Los Angeles Gas and Electric Corporation, Los Angeles, Calif., Mrs. Marvel Murray, Chairman.

Puget Sound Power & Light Company, Bellingham, Wash., Mrs. Agnes M. Hobson, Chairman.

Northwest Cities Gas Company, Walla Walla, Wash., Mrs. Jessie McReynolds, Chairman.

Miss Clarita Scott, General Chairman, Los Angeles Gas and Electric Corp.

H. B. CLINE, FORMER TREASURER OF L. A. G. AND E., DIES

Horace B. Cline, former treasurer of Los Angeles Gas and Electric Corp., Los Angeles, and an employee of that company for 37 years, died on November 19.

Mr. Cline was a native of San Francisco, where he was born on October 8, 1873. Coming to Los Angeles when a young man, he entered the employ of the utility company as a bookkeeper in July, 1891. Nine years later he was made paymaster and then assistant treasurer in 1903. In 1916 Mr. Cline was named treasurer of the corporation. In June, 1928, he resigned from the gas and electric company employ after having been with the organization 37 years. Since that time he has been executive secretary for W. B. Cline, former president of the Los Angeles Gas and Electric Corp., and now chairman of the board.

COURSE IN GAS DISTRIBUTION UNDER A. R. BAILEY

A course in gas distribution was started by the Coast Counties Gas & Electric Co., of Santa Cruz, Calif., in its Watsonville office on November 17. The class will meet once a week for 12 weeks, and will be under the direction of A. R. Bailey, gas engineer of the company.

Two text books are being used for the course: Diehl's "Natural Gas Handbook" and "Efficient Combustion," by Light. Subjects to be covered include the physical laws of gas, chemistry of combustion, measurement of gas, pipe line flow and general distribution topics.

SEATTLE APARTMENTS EQUIPPED WITH "ALL GAS" KITCHENS

Wedgewood Court Apartments, opened late in October, in Seattle, Wash., have been designed and built to furnish complete modern home conveniences at a price within reach of lower salaried workers. The Pullman-type kitchens are equipped with closed top Tappan gas ranges and EL-3 Electrolux refrigerators in one unit—the range resting on top of the refrigerator box. The cost of gas for all apartments is included in the rental. There will be 140 apartments in the entire project of four buildings, which will be completed by February, 1931.

SAN DIEGO CONSOLIDATED BUILDS LINE TO CARLSBAD

San Diego Consolidated Gas and Electric Co., San Diego, Calif., has begun construction of the line which will join one already constructed to Carlsbad by the South Coast Gas Co., recently purchased by the San Diego utility. The distance between the end of the line from San Diego, completed to the Biological grade at La Jolla, to Carlsbad is 25 miles, and this stretch of transmission main will soon be completed, linking the two systems.

San Diego Consolidated was recently granted authority by the California Railroad Commission to purchase and the South Coast Gas Co., to sell, the properties of the latter in Oceanside, for the sum of $211,500, plus the costs of additions and betterments up to the time of the transfer.

1930-1931 Calendar

Tenth Annual Gas Meter Short Course—Ames, Iowa, December 9-12, 1930

Southern California Meter Association—Los Angeles, Calif., December 18, 1930.

Fourth National Fuels Meeting, A.S.M.E.—Chicago, Ill., February 11-13, 1931.

Western Metals Congress and Exposition—San Francisco, February 16-21, 1931.

Pacific Coast Gas Association Accounting Section—Los Angeles, Calif., last week in February, 1931.

P.C.G.A. Technical Section—Los Angeles, first week in March, 1931.

P.C.G.A., Joint Conference, Commercial and Publicity and Advertising Section—Los Angeles, Calif., April, 1931.

Missouri Association of Public Utilities—Excelsior Springs, Mo., April 16-18, 1931.

Arizona Utilities Association—Annual Convention, April, 1931.

Natural Gas Department, A.G.A.—Annual Convention, Memphis, Tenn., May, 1931.

Pacific Coast Gas Association—Annual Convention, September, 1931.

American Gas Association—Annual Convention, Atlantic City, October 12, 1931.

WINSLOW, ARIZ., TO VOTE ON SALE OF MUNICIPAL GAS PLANT

According to late press dispatches, an election will be held by the city of Winslow, Ariz., on December 10, to determine if the municipal gas plant will be sold to the Standard Management and Operating Corp. of San Francisco, Calif.

John Collins, Jr., Chief Engineer *for* S. M. & O.

OFFICIALS of Standard Management and Operating Corporation have just announced the appointment of John Collins, Jr., as chief engineer.

John Collins, Jr.

Mr. Collins comes to Standard Management and Operating Corporation from the New York offices of the United States Engineering Corporation, with which he has been connected for the past several years as vice-president and chief engineer. Previous to that time he held similar positions with other large public utility enterprises among which were the National Public Service Company, Brooklyn Edison Company, American Sugar Refining Company, Public Production Company of New Jersey and General Engineering and Management Corporation. Mr. Collins also acted as assistant chief engineer for the J. G. White Management Corporation, owners and operators of large public utility properties throughout the United States and in foreign countries.

As chief engineer for Standard Management and Operating Corporation, Mr. Collins will be in charge of all construction and engineering enterprises performed by the management company for Pacific Public Service, its subsidiaries and other clients of the company. He will also act in an advisory capacity regarding operations on properties now controlled by Pacific Public Service.

H. W. BURKHART, PIONEER IN GAS INDUSTRY, KILLED IN ACCIDENT

Henry W. Burkhart, serving in an executive capacity with the Natural Gas Corp. of California, died on October 31 from injuries received in an automobile accident on October 28. He was 59 years of age, and had spent a quarter of a century in helping to develop the gas industry on the Coast.

Coming to California from Illinois about 30 years ago, Mr. Burkhart had since been closely identified with the development of major enterprises in the industry. He served for many years as vice-president in charge of gas properties of Southern California Edison Co., and since the transfer of those properties to Southern Counties Gas Co. and Southern California Gas Co., he acted as consulting engineer, and was interested in various new gas utility enterprises in the West. It was due to his efforts that the Inland Empire Gas Co., headquartered at El Centro, Calif., was organized. He remained in an executive post with that company until its purchase by Natural Gas Properties, Inc., San Francisco.

Mr. Burkhart was injured while on his way to attend the opening of a new butane plant of the Natural Gas Corp. of California at Calexico.

BOWMAN, N. D., CELEBRATES LINE'S COMPLETION WITH "GAS DAY"

Montana-Dakota Power Co., headquartered at Minneapolis, Minn., recently completed a 29-mile natural gas extension from the Cabin Creek-Marmarth line to serve Bowman, N. D. The coming of gas was celebrated by the towns people with "natural gas day".

Five Cities Grant Montana Power Natural Franchises

THE cities of Butte, Anaconda, Bozeman, Livingston, and Deer Lodge, Mont., have granted the Montana Power Co. of Butte, franchises for the service of natural gas. The company has applied also in Big Timber and Columbus.

Source of supply of the gas for consumption in these cities has not been definitely decided, but it is intimated that the line will be built from one of the northern fields, a distance of approximately 250 miles. The cost is estimated at $15,000,000.

In its applications to the various cities for franchises, the company is reported to have agreed to start work on the project by May 1, 1931, and to be ready to supply gas for industrial and commercial use by January 1, 1932. The industrial load is expected to be unusually heavy in the Butte and Anaconda districts, which are important mining centers.

According to report, the chamber of commerce of Missoula has asked the company to consider an extension to that city from the line to Deer Lodge.

Montana Power Co. is an Electric Bond and Share Co. interest.

PUBLIC UTILITY INVESTMENT CO.'S NEW BUILDING COMPLETED

The office building, under construction during the summer months, for the Public Utility Investment Co., Salina, Kan., was recently completed, and the company is now occupying its new home.

The two-story structure gives the company one of the best locations in the center of the business district of Salina, and was designed to bring together under one roof the main operating offices of the company. The accounting department will be located at former headquarters, less than a block away.

The new building is complete in all detail, having a modern heating and ventilating system, sound insulation between floors, mailing room, supply elevator, and an intercommunicating automatic telephone system. The building is flood-lighted at night.

OMAHA REJECTS NATURAL GAS FRANCHISE PROPOSAL

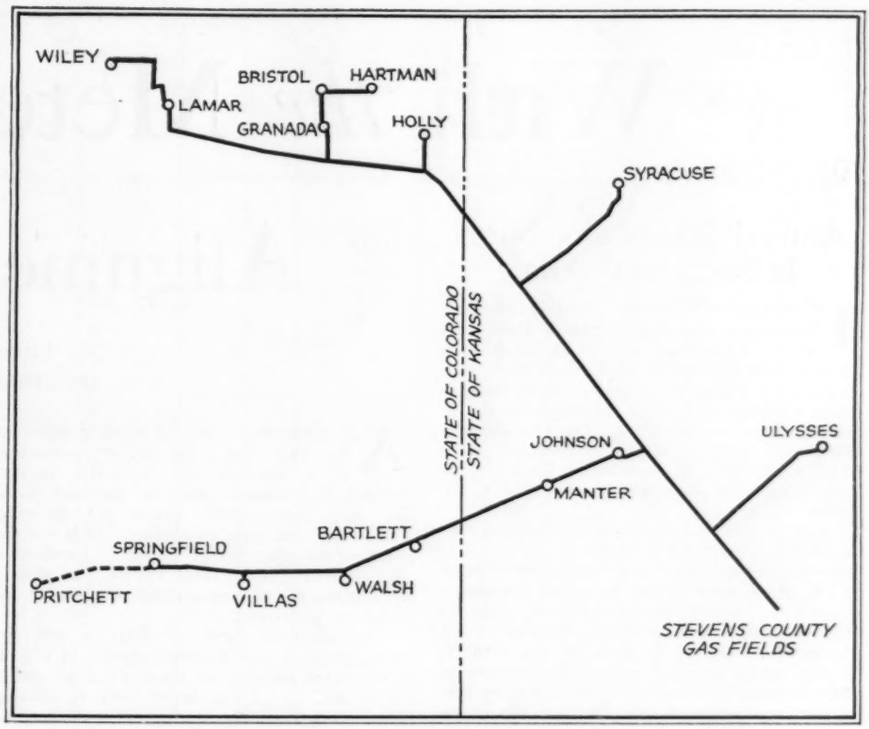
Omaha voters, on November 26, rejected the proposal of the Western Natural Gas Co., of Tulsa, Okla., to bring natural gas to the city. The company proposed bringing a special line from the Shamrock fields in Texas to serve the city. Natural gas was offered Omaha domestic users at 75 cents per M.c.f., with volume consumption rates.

H. M. SAUBERT MANAGER OF GREAT FALLS GAS CO.

H. M. Saubert has been appointed manager of the Great Falls Gas Co. and Great Northern Utilities Co. of northern Montana, succeeding O. W. Bockeloh who died October 18. Mr. Saubert was formerly manager of the Capital Ice Refrigerating Co. of Indianapolis, Ind., a William A. Baehr property.

GAS APPLIANCE CO. TO HANDLE SALES AT MINNEAPOLIS, KAN.

The Gas Appliance Co. has opened offices at Minneapolis, Kan., and will handle gas appliance merchandising in that district for the Union Public Service Co., Kansas City, Mo.



Sketch showing recently completed development of the Colorado Gas & Utilities Co., Denver, Colo. Two hundred and fifty miles of line were laid to bring service to 13 Kansas and Colorado communities. The dotted line shows projected transmission main to Pritchett, Colo.

Service *for* 13 Colo.-Kansas Towns

COLORADO Gas & Utilities Co., headquartered at Denver, Colo., a new utility in the Mid-Continent and Rocky Mountain districts, recently completed its 250-mile development, taking a 91-mile main transmission line from Stevens County, Kan., gas fields to Lamar, Colo., and extending its service through laterals to 12 other communities. A branch line leaves the main carrier at a point near Johnson, Kan., extending southwest to Springfield, Colo., and serving Johnson, Manter, Bartlett, Walsh and Villas en route, with a projected extension to Pritchett, where the franchise has been secured by the company.

Taking a northwesterly direction, the main line follows crow flight for about 60 miles, then takes an almost due west course to Lamar, extending north to Wiley. Bristol, Granada, Hartman and Holly, Colo., are served by laterals from the main line.

Twenty-four miles of the main line was built of 8-inch pipe, and the remainder of 6-inch. Distribution systems have been constructed in all of the towns and service has begun. The entire project, from franchising to beginning of service was completed in about five months.

Colorado Gas & Utilities Co. was organized recently, with A. J. Hardendorf as president, D. B. Cogswell, vice-president, and L. L. Stone, secretary-treasurer. Homer A. Salter is manager for the company at Lamar.

The schedule of rates set up for these 13 communities is as follows: 75c for the first 2,000 cubic feet; 65c for the next 8,000 cubic feet; 50c for the next 10,000 cubic feet, and a flat rate of 25c for all over 10 million cubic feet.

NATURAL GAS PROPERTIES, INC., REPORTS ACTIVE PROGRESS

Natural Gas Properties, Inc., headquartered in San Francisco, reports active progress in its program to bring butane service to cities and towns in Washington, Oregon, and California.

In Washington, construction is actually under way on plants and distribution systems at Port Townsend, Anacortes, Camas, Arlington, Mount Vernon and Shelton, and plans are practically complete for the beginning of work on the systems at Sedro-Woolley and Port Angeles.

In Oregon, construction has started on the plants at Tillamook, Klamath Falls, Coquille, La Grande and Bend.

Systems in California completed recently include those in Calexico, Brawley and Newman. Construction is under way on the plant at Fortuna, and a franchise has been granted at Colfax.

KANSAS PIPE LINE & GAS CO. ASKS MARQUETTE PERMIT

Kansas Pipe Line & Gas Co., Salina, Kan., has applied for a franchise for the service of natural gas in Marquette, Kan.

NEW MAYWOOD OFFICE FOR SO. CALIFORNIA GAS COMPANY

Southern California Gas Co. expected to open a new office in Maywood, Calif., about the first of December.

With *the* Metermen

Annual Exhibitors Night Is Successful Affair

IN connection with its monthly meeting, November 19, the Southern California Meter Association staged its second annual exhibitors' night. More than a score of individual company exhibits, representing a wide selection of modern measurement equipment, were on display in the Los Angeles Gas and Electric Corp. auditorium, from 4:00 to 10:30 p.m., and were inspected by the Association membership and many visitors.

The dinner and business meeting was attended by 144, and featured a discussion of the production and distribution of butane. F. S. Honberger of the Southern California Gas Co. covered the subject ably, and in the discussion following his remarks, P. S. Magruder and F. S. Burt of the General Petroleum Corp. made valuable contributions. Mr. Magruder speaking particularly on production phases, and Mr. Burt on the transportation of butane.

M. J. Cereghino, of the Los Angeles Gas and Electric Corp. served as chairman of the committee which had charge of the exhibits, and announces the following list of companies conducting displays at the exhibitors' meeting:

Neilan Co., Ltd.; Natural Gas Equipment, Inc.; Robinson Orifice Fitting Co.; W. R. Ladewig; National Meter Co.; Reliance Manufacturing Co.; Brown Instrument Co.; Westcott & Greis, Inc.; Leeds and Northrup; Pacific Pipe & Supply Co.; Pittsburgh Equitable Meter Co.; The Foxboro Co.; Commercial Iron Works; Consolidated Ashcroft Hancock Co. Inc.; Braun Corp.; Warren and Bailey; The Bristol Co.; Pacific Meter Works; Sutor and Co.; Sprague Meter Co.; Midwest Piping and Supply Co.; Merco Nordstrum Valve Co.

Tenth Annual Gas Meter Short Course *at* Ames

The Tenth Annual Gas Meter Short Course, conducted by the Mid-West Gas Association and the Iowa State College, is scheduled to be held December 9, 10, 11 and 12, at Ames, Iowa.

Instruction in meter testing and repairing will be given by experienced men in a completely equipped meter shop. Arranged especially for executives and managers, the program will include 12 papers dealing with various phases of natural gas.

The entertainment feature of the course is the annual banquet, scheduled for December 12, and Joe Ainsworth, chairman of the banquet committee, is making plans for the 10th anniversary.

L. W. Mahone is chairman of the Short Course Committee.

MINNEAPOLIS GAS CO. FRANCHISE RENEWED BY THE CITY

Minneapolis Gas Co., Minneapolis, Minn., was recently awarded a renewal of its franchise in that city. The franchise was granted with a proviso that it shall be renewed every three years.

Alignment Charts

By THOMAS T. GILL
*Union Oil Company of California**

AN alignment chart is nothing more or less than the graphical representation of a mathematical formula, so arranged that answers may be obtained without any calculations, simply by drawing lines from one scale to another. It is not the purpose of the present paper to deal with the construction of these charts, but simply to explain the use of several of them of interest to metermen.

The simplest form of chart is one for multiplication and division, shown in Fig. 1. This chart consists of three parallel scales, A, B and C. To multiply 3 by 4, draw a line from 3 on A to 4 on C and the line will intersect B at 12. To divide 32 by 8, draw a line from 8 on C through 32 on B, and the line will pass through 4 on A. Any line intersecting the three scales will thus obtain values for the equation,

$$a \times c = b, \text{ or } a = \frac{b}{c}$$

A little experimentation with Fig. 1 should show the possibilities of alignment charts in solving for an unknown when two other values are given. Thus, if a and b are known, c may be found; if a and c are known, b may be found; and likewise if a is unknown.

Some alignment charts consist of more than three scales, in which case a key is given to show in what order, or in what combinations, the scales are to be used. If a key should read

A B C
B D E
D F G

it would mean that A, B and C must always be used together, but that B might also be used with D and E, and D was to be used also with F and G. If we know A, C, E and F and wish to find G, we must proceed

*Presented before the Southern California Meter Association, September 25, 1930.

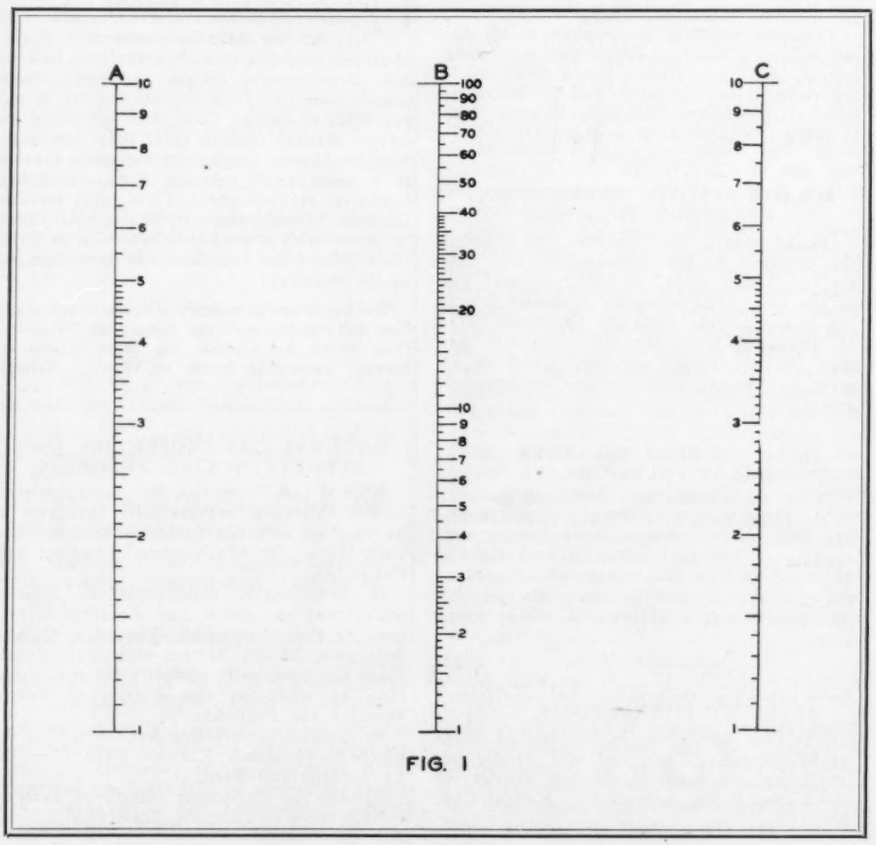


FIG. 1

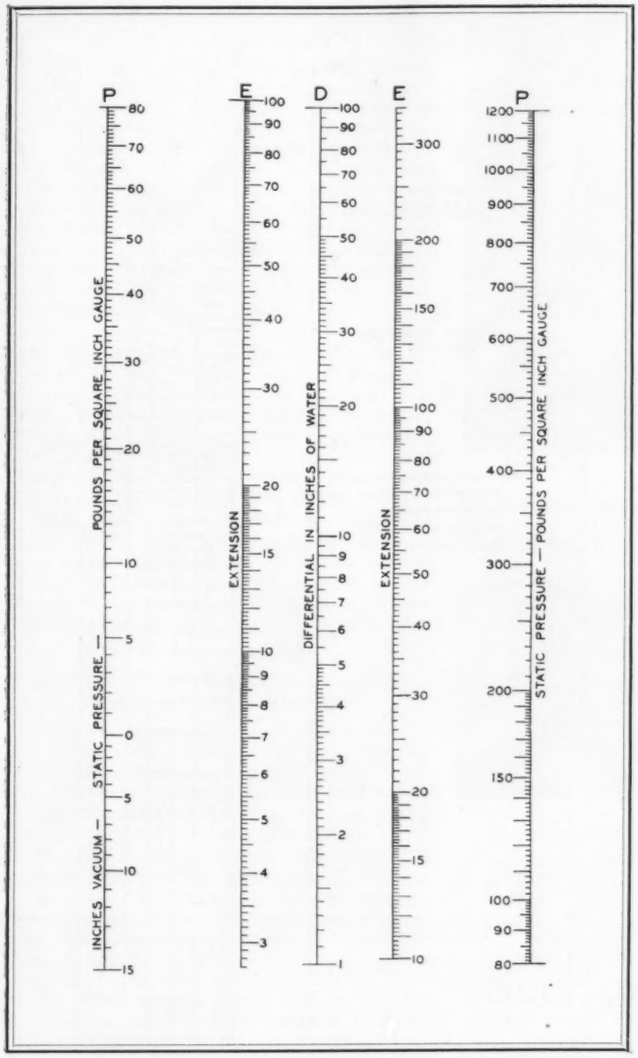


Fig. 2. Pressure extensions for orifice meter calculations.

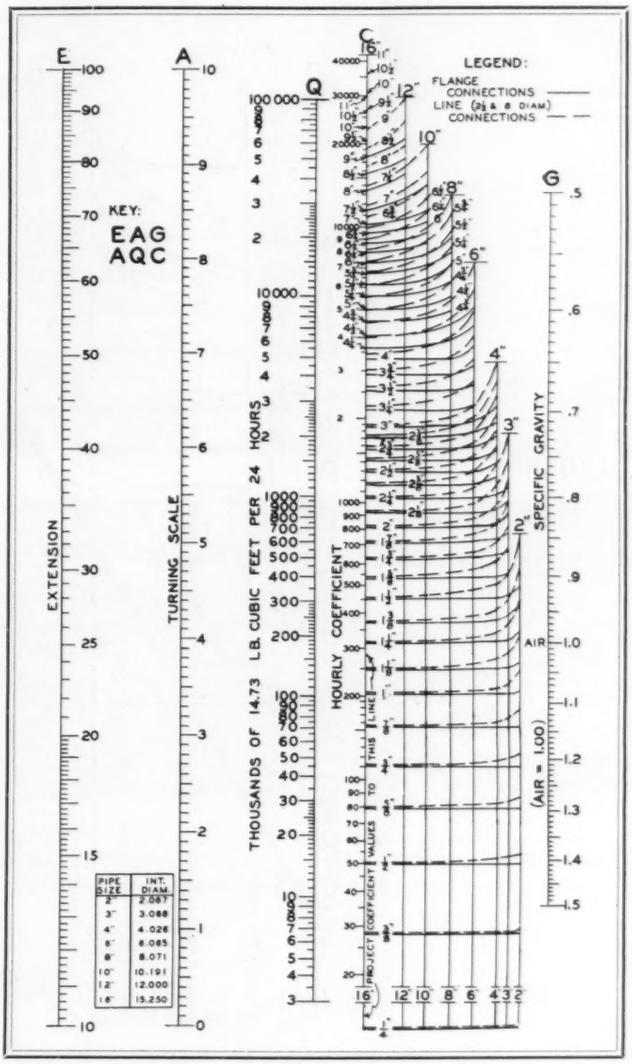


Fig. 3. Gas and air orifice meters.

as follows: Draw a line from A to C and find B. Then draw a line from B to E and get D. Then proceed from the point found on D, drawing a line through the known point on F, and obtain the answer on G. It is evident that B is merely a turning scale, and represents merely the combination of A and C. The same also holds true of D, which is a combination of A, C and E.

Fig. 2 is an alignment chart for obtaining pressure extensions used in orifice meter calculations. The chart consists of five scales, the center of which is to be used with either of the outside scales, to obtain answers on the second and fourth scales. The following problems will serve to illustrate the use of the charts to be considered.

Problem 1: An orifice meter shows a drop across the orifice of 15 inches of water and the static pressure is 42 pounds per square inch gauge. What is the pressure extension? *Solution:* On Fig. 2 draw a line from 15 on the third scale to 42 on the first scale, and get an extension of 29 on the second scale.

Problem 2: A meter shows a static pressure of 150 pounds gauge and a differential of 10 inches. What is the extension? *Solution:* On Fig. 2 draw a line from 10 on the third scale to 150 on the fifth scale, and get 41 on the fourth scale as the extension.

By using pressure extensions found from Fig. 2, metering problems in gas and air may be approximately solved on Fig. 3.

Problem 3: How much gas in standard cubic feet will pass through a 3-inch orifice in a 6-inch pipe in 24 hours if the static pressure is 56 pounds per square inch gauge (atmosphere assumed 14.7 pounds per square inch absolute) and the drop across the orifice is 22 inches of water; line connections 2½ diameters upstream and 8 diameters downstream are used, and the gravity of the gas is .68? *Solution:* First secure the pressure extension from Fig. 2 by drawing a line from 22 on the center scale to 56 on the first scale, obtaining 39 on the second scale. Then on Fig. 3 draw a line from 39 on E to .68 on G, obtaining 6.05 on the turning scale A. Between scales Q and G on Fig. 3 will be found a number of vertical lines representing pipe sizes, intersecting curved lines representing orifice sizes. The solid curved lines are for flange and the dashed lines are for line connections. Follow the 6-inch vertical line until it crosses the dashed curved line marked 3-inch, and then project this point at right angles to the vertical line marked 16-inch, striking the 16-inch line approximately at 2250. The method of projecting this point is shown in Fig. 4. Next draw a line from 6.05 on A to 2250 on C and obtain 2500 on Q. The orifice will therefore pass 2,500,000 standard cubic feet of gas in 24 hours.

Fig. 4 shows the method of projecting coefficient values on Fig. 3. In the figure, a small triangle is being used to project a 1⅜-inch line-connected orifice in a 3-inch pipe to the left at right angles to the 10-inch pipe size line. The projected point falls on the 10-inch line a little below the value for a 1½-inch flange connected orifice in a 10-inch pipe.

Problem 4: It is required to pass a million cubic feet of gas in 24 hours through a 6-inch pipe having a flange connected orifice; gravity of gas .80; static pressure 29 pounds gauge and average differential 25 inches of water. What size orifice is required? *Solution:* Obtain pressure extension from Fig. 2 by drawing a line from 25 on the center scale to 29 on the first scale, getting 33 on the second scale. On Fig. 3 draw a line from 33 on E to .80 on G, cutting A at 5.2. From 5.2 on A draw a line through 1000 M on Q, which will pass through 1150 on Scale C. Project this value to the right at right angles until it strikes the vertical line for a 6-inch pipe. The solid curved line marked 2⅜-inch passes through

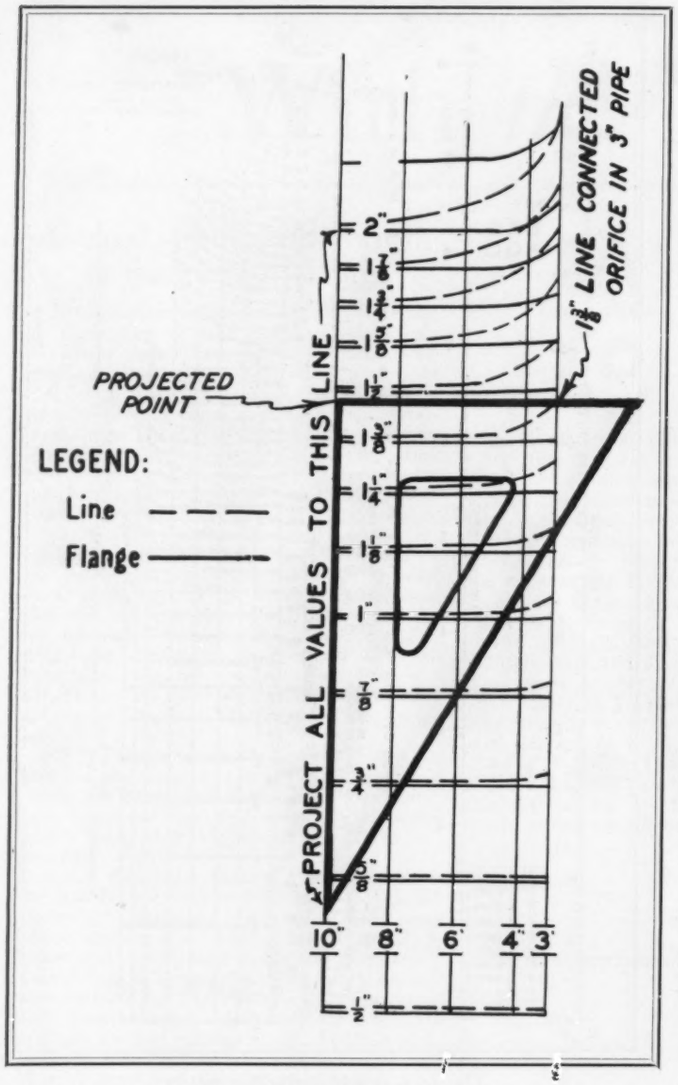


Fig. 4.

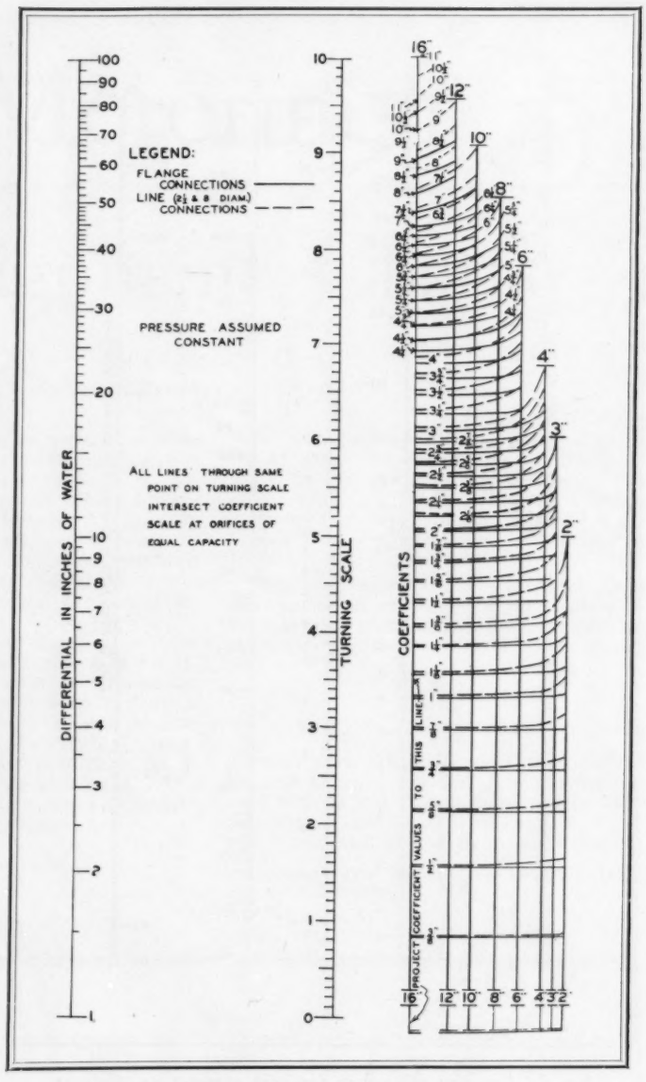

LEGEND:
FLANGE CONNECTIONS
LINE (2½ & 8 DIAM.) CONNECTIONS
PRESSURE ASSUMED CONSTANT
ALL LINES THROUGH SAME POINT ON TURNING SCALE INTERSECT COEFFICIENT SCALE AT ORIFICES OF EQUAL CAPACITY
DIFFERENTIAL IN INCHES OF WATER
TURNING SCALE
COEFFICIENTS
PROJECT COEFFICIENT VALUES TO THIS LINE

Fig. 5. Orifices of equal capacity.

this point, and is the size of orifice required.

Problems involving the measurement of air may be solved on Figs. 2 and 3 by using a gravity of 1.00. For extensions less than 10, use the required extension, multiplied by 10, and then divide the resulting number of cubic feet by 10.

On Fig. 3 it will be seen that in all the values to be projected upon Scale C, the line coefficients are higher numerically than the flange coefficients. Consequently the orifice sizes to the left of the upper part of the C scale are for flange connections, and those between the 16-inch and 12-inch lines and above 4-inch in size are for line connections.

Fig. 5 can be used for changing orifice plates. The pressure, gravity and temperature are presumed to stay constant. The purpose of the chart is to show changes in differential for changes in orifice size, or for changes in both orifice and pipe size.

Problem 5: A 3-inch orifice with flange connections in a 6-inch line gives a differential of 55 inches of water with a certain flow of gas. It is desired to change the size of the orifice plate so that the differential will be near the center of the chart and will read approximately 20 inches. What size orifice is needed? *Solution:* Obtain coefficient value on right hand side of Fig. 5 by noting point of intersection of 6-inch vertical line with 3-inch solid curved line, and projecting this point to the left at right angles upon the 16-inch line. Draw a line from this point on the 16-inch line to 55 on the left hand scale and get 6.75 on the center scale. From 20 on the left hand scale draw another line through 6.75 on the center scale and prolong it until it cuts the 16-inch line, projecting to the right at right angles upon the 6-inch line. It is found that the next larger orifice size is 4 inches in diameter.

Note: The charts (copyrighted) reproduced with this paper are taken from "Compression and Natural Gas Alignment Charts," by Thomas T. Gill; Gulf Publishing Co., Houston, Texas.

A. G. A. MEASUREMENT COMMITTEE ISSUES REPORT ON METERS

Report Number 1 of the Gas Measurement Committee of the Natural Gas Department of the American Gas Association just issued, contains construction, installation and operating specifications for orifice meters and rules for determining co-efficients and modifications of the co-efficients. Copies may be ordered from the A. G. A. headquarters, 420 Lexington Ave., New York, at 50 cents each. This report is the work of several years' research on the part of the United States Gas Measurement Committee in cooperation with the Bureau of Mines.

TWO NEW CATALOGS PUBLISHED BY PITTSBURGH EQUITABLE

Pittsburgh Equitable Meter Co., Pittsburgh, Pa., has issued two new catalogs giving information on Emco balanced valve regulators and the new "Emcorector." A copy of either or both may be obtained by addressing the company at 400 North Lexington Ave., Pittsburgh, Pa.

MIDWEST NATURAL GAS CO. WANTS TO SERVE MADISON, NEB.

Midwest Natural Gas Co., Lincoln, Neb., has applied for a franchise to serve natural gas to Madison, Neb.

APPLIES TO SERVE BUTANE GAS IN 30 ARIZONA TOWNS

The largest single application for authority to establish public utility services in Arizona in point of the number of units to be operated, was filed with the state corporation commission November 14 by attorneys for W. M. Hines, Pacific Coast operator. The applicant, according to Arizona press dispatches, is understood to be representing the Pacific Utilities Co., of California, which desires to install gas manufacturing and distributing plants in 30 Arizona towns. Butane service is contemplated in these communities, according to reports.

Towns that would be served by gas plants and distribution systems proposed to be installed by the company include Flagstaff, Winslow, Williams, Holbrook, Clifton, Safford, Jerome, Benson, Thacher, Somerton, Wickenburg, Wilcox, Morenci, Clarkdale, Ray, Hayden, Sonora, Ajo, Bowie, St. Johns, Oatman, Scottsdale, Duncan, Humboldt, Solomonville, Patagonia and Clemenceau.

This includes practically every important town in the state not already served by a gas plant. Only one of the cities named, according to the application, is now served by gas manufactured and distributed within the municipality, and that is Winslow.

MORE UTAH TOWNS MAY HAVE NATURAL BY SUMMER

Natural gas will be piped into towns in the Cache Valley, Utah, if the State Utilities Commission places its approval on the franchises recently granted to the McFayden-Fitzpatrick interests, carrying on franchising activity in the Utah-Idaho district.

The line would start from Ogden, parallel the state highway through Perry and Willard to Brigham City. It would then go through Boxelder canyon to the Sardine Canyon summit, then direct to Wellsville. From that point it would go practically in a straight line east to the other side of the valley, then to the Idaho line to Franklin and Preston, on to Downey, and follow the highway to Pocatello. Construction of the line would start as soon as the frost leaves the ground, according to report, and would be complete in about three and one-half months.

ARIZONA EDISON CO. IS PREPARING SYSTEMS FOR "NATURAL"

Arizona Edison Co., Phoenix, Ariz., is reported to be planning the expenditure of $100,000 in preparing the Douglas, Globe and Miami systems for the delivery of natural gas to the company's consumers in that district. W. D. Von Kennell, industrial engineer of the company is in charge of the work.

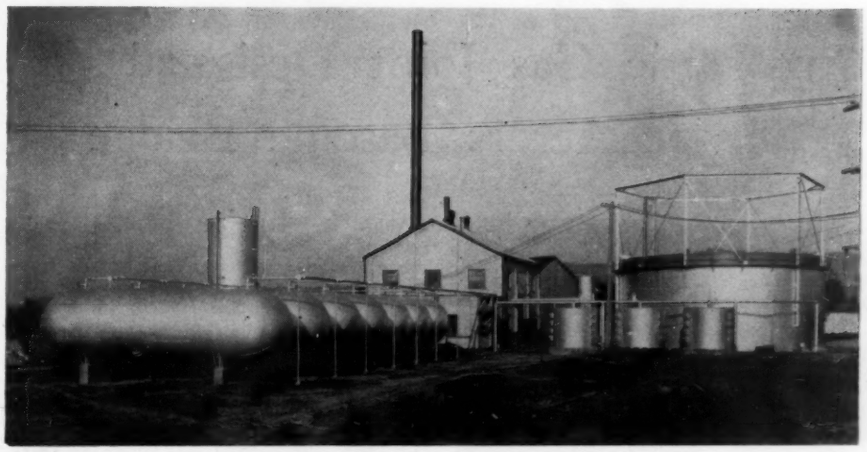
Natural gas is expected to be supplied to these towns through the transmission line of the Western Gas Co., from El Paso to Douglas, with a branch line serving Globe and Miami. Survey of the line was complete in October.

ROCKY MOUNTAIN GAS CO. PLANS NEW HEADQUARTERS

The Rocky Mountain Gas Co., Casper, Wyo., Ohio Oil Co. subsidiary, is said to be planning construction of an office building, to be started early in the spring.

SOUTHWEST DISTRIBUTING CO. OPENS OFFICE IN JASPER

The Southwest Distributing Co., subsidiary of the Dixie Gas & Fuel Co., United Gas Corp. unit, has recently opened a new office in Jasper, Texas.



UPPER: View showing 50,000 cubic foot relief holder, seven high pressure holders, with three purifiers, of the new Longview plant. LOWER LEFT: New office of the Western Gas Company of Washington, at Kelso. LOWER RIGHT: Interior of the Kelso Office.

Service Begun *by* Longview Plant

WESTERN Gas Co. of Washington, formerly known as the Western Gas and Utilities Corp., a subsidiary of Public Utility Investment Co., Salina, Kan., recently celebrated the completion of the Longview - Kelso plant and distribution systems, together with the opening of the company's new office in Kelso.

C. B. Shaklee

The new plant is located in Longview, serving Kelso through a connecting main under the bed of the Cowlitz River. The new unit is a bituminous coal and fuel oil carbureted water gas generating set, with a capacity of 25,000 feet of 525 B.t.u. gas per hour. Equipment includes one 50,000 cubic foot single lift relief holder, seven high pressure storage holders, three purifiers, one scrubber, one oil storage tank, and all necessary generating and compressing equipment. The plant has been constructed to serve a population of 30,000.

About 25 miles of distribution main has been laid in Longview, and 15 in Kelso, which together with the connecting main, makes a total of nearly 60 miles of line which has been laid for the new service.

C. B. Shaklee is general manager of the gas division of the Public Utility Investment Co. Serving as manager of the Western Gas Co. of Washington's Longview office is L. M. Longan. He will have as assistants Joe Dunbar, in charge of commercial development, and Harold Ridgeway, in charge of accounting. W. B. Brown is in charge of the plant.

R. Kenneth Evans of the commercial department of the parent company, directed the opening of the plant and Kelso office.

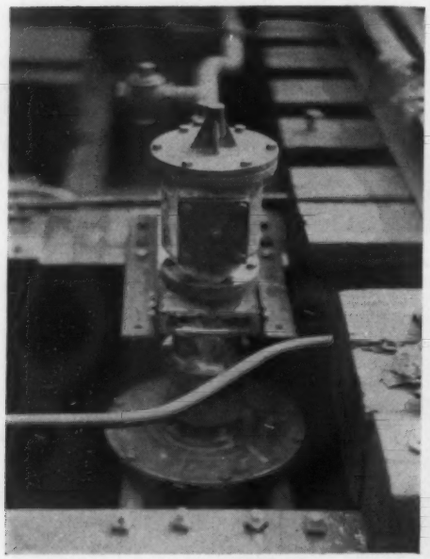
Diversified Utility Investments, Inc., also headquartered at Salina, Kan., is a new organization headed by Nathan L. Jones, president of the Public Utility Investment Co., and will act as a holding company for properties operated by the latter organization.

A new plant is being constructed at Bremerton, Wash., which will come under the supervision of the Western Gas Co. of Washington. This plant will be virtually a duplication of the one at Longview, and will be completed sometime during the first of the year.

SO. CALIF. GAS GETS START ON OPENS OFFICE IN JASPER

Southern California Gas Co. expected to launch butane gas service in Palmdale, Calif., about December 1, from its newly completed plant in that community. Consumers in Mohave will get butane gas about January 1. The company's Lancaster plant has been operating for several weeks, and appliance sales activity is proceeding in all of the above territory.

Automatic Gas Joint Designed *for* Service Across Bascule Bridge



The valve installed

TAKING gas across the Burrard Inlet to North Vancouver, B. C., without using an under water main has been accomplished by engineers of the B. C. Electric Power and Gas Co., Vancouver. A special joint was designed which adapts itself to the raising and lowering of the bridge across the Second Narrows, incorporating an automatic valve. This valve was invented by F. E. Reed, an engineer of the gas department staff, and is believed to be the first of its kind to be used by any gas company in the distribution of its product.

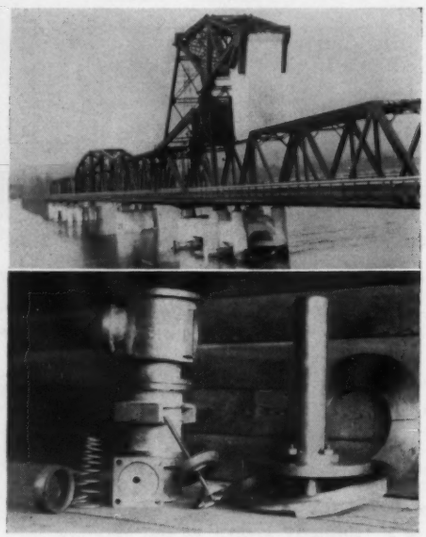
At first it was thought that the most suitable place for laying a submerged gas main would be alongside the city water pipes, of which there are 10, each 1½ inches thick, 18 inches in diameter, and weighing over 450 pounds per foot. These pipes would help protect the gas line which would be supplemented by a small main over the bridge. This could be connected up and used for emergency purposes should any break or trouble occur in the under water pipe.

Careful thought was given to this plan and to the alternative, the new automatic joint. Finally, in view of the physical difficulties which would have to be encountered, including a tidal current of seven to eight knots an hour, and the uneven contour of the inlet bed which lies over 90 feet below the surface and has a land slope of about 45 degrees of both sides, it was definitely decided not to use the submerged main.

Little difficulty was met in laying the main across the bridge, the pipe being placed on the steel work close to the ties on the east side of the bridge. On the hinge section of the bascule lift a length of flexible tubing was installed. Then on the bascule itself the pipe was attached by means of clamps welded to the steel work of the bridge with two expansion joints. At the other end of the bascule was installed the new automatic joint.

When the bridge opens or lifts for the passage of vessels the joint comes apart and the gas supply to North Vancouver is automatically cut off. This does not affect the supply to the consumer for the demand is taken care of by the storage of gas in the holder on the north side of the inlet. On the north side there are a series of check valves in the mechanism which prevent the gas coming back and escaping. When the bridge comes together again the joint automatically couples itself and opens the valve for the normal flow of gas.

The joint has a special system of packing which assures it being gas tight. It was



UPPER: Bridge over the Burrard Inlet, showing bascule mechanism. LOWER: Valve parts, ready for assembly.

tested to 125 pounds water pressure and 65 pounds air pressure. It also takes care of any variation in any side play, expansion or contraction of the bridge through changes in temperature.

The valve, with the exception of the leather packing, is made of bronze, to guard against pitting or rusting, and withstand the salt atmosphere condition to which it will be subjected. There is comparatively little wear on the moving parts. The valve is so designed that it can be repaired, adjusted, or entirely taken out, in part or in section, without any relation to the raising or lowering of the bridge.

An agreement was reached with the bridge company for laying a main across the structure on an annual rental basis.

The pipe across the bridge was welded, and a number of expansion joints were installed to take care of the expansion and contraction of the pipe through changes in temperature. It is expected to heat the bridge tender's quarters, ticket office, etc., and the company's main offices, with gas from this pipe.

So as to ensure continuity of gas supply in the district and city of North Vancouver, it was decided to install in the close vicinity of the bridge a high pressure holder having a capacity of 41,000 cubic feet at 50 pounds pressure. It is built of steel plate 17/32 of an inch thick with triple riveted lap.

The total cost of the construction work from the compressor station at Grand View to the end of the trunk line in North Vancouver, including the holder, was approximately $50,000.

CHANGE OVER AT ALBUQUERQUE COMPLETE EARLY IN DECEMBER

Work of changing over the gas distribution system in Albuquerque, New Mexico, was expected to be complete early in December, with arrangements made to distribute the new fuel through the mains of the Albuquerque Gas & Electric Co., a Federal Light & Traction property, which is in turn a Cities Service subsidiary.

Southern Union Gas Co., of Dallas, Texas, holds the Albuquerque natural franchise, and recently brought a 175-mile transmission line from the San Juan Basin fields near Farmington, to Albuquerque and Santa Fe. Santa Fe is already being served.

Southern Union expects to spend about $100,000 in preparing the system for natural gas, during the coming spring and summer months.

W. S. Doles, chief gas engineer of the Federal Light and Traction Co., is in charge of the change over work.

COUNCIL BLUFFS NOW RECEIVING MIXED NATURAL GAS

Council Bluffs, Iowa, received its first natural gas on November 12, through the mains of the Council Bluffs Gas Co., holder of the franchise. Supply for the system comes from the Northern Natural Gas Corp's. line from Texas fields to metropolitan centers in the Middle West.

The change over is being made on a mixed natural gas, and is being directed by S. E. Cowan of Salt Lake City, Utah, who supervised the change over in that city. Mr. Cowan has a crew of 75 men working, and expects to have the entire city on a straight natural gas basis by December 15.

Franchise was granted to the Council Bluffs Gas Co., of which H. C. Holder is manager, late in October.

CHANGE IN RATE SCHEDULE FOR WEST TEXAS GAS CO.

R. F. Hinchey, vice-president of the West Texas Gas Co., announced that beginning with the last October meter reading, reduced gas rates will be in effect throughout the entire system of the company, which headquarters at Lubbock, Texas.

Minimum rates of $1.50 for Class 1 and 2 remain the same, while the minimum rate for Class 3, industrial plants, will be $25 per month. Under the new rates the price for the first 50,000 cubic feet is 67½ cents per M.c.f., the same as the old, while for all gas over that amount, the new rate is 50 cents per M.c.f.

The average reduction for the first three classes is 3.7 cents per M.c.f., according to Mr. Hinchey.

SAN ANTONIO P. S. CO. HOLDERS ARE BEING REPAINTED

Two gas holders of a combined capacity of 2,500,000 cubic feet of the San Antonio Public Service Co., San Antonio, Texas, are being renovated and painted at a cost of $13,000.

Reviewing the Southwest Sales Conference

By JOE BUCKINGHAM
Dallas Manager, Western Gas

CHESTER L. MAY
Chairman, Southwest Natural Gas Sales Conference

GAS companies should aggressively merchandise appliances, at the same time helping other dealers in their efforts to sell all approved appliances, according to a resolution unanimously adopted at the close of a two-day session of the First Southwest Natural Gas Sales Conference. Sponsored by the Commercial Section of the American Gas Association, of which J. W. West, Jr., is chairman, the southwest gathering represents the second natural gas sales conference to be conducted under the leadership of the A. G. A., the first being held in February of this year at Pittsburgh, Pa.

Chester L. May, vice-president of the Community Natural Gas Co., is chairman of the Southwest Regional Natural Gas Sales Council, under whose direction the meetings were held.

The conference was held November 13 and 14, at the Adolphus Hotel in Dallas, Texas, with an attendance exceeding 300, representing sales executives, salesmen and other personnel from gas companies and manufacturing firms in 21 states. Success of this first meeting was so pronounced that the gathering moved unanimously to continue the annual sessions. Time and place of the next conference will not be announced for several weeks, however.

Dealer cooperation was the most discussed subject before the conference during its two day program. As a result a committee appointed by Mr. May, chairman of the Council, expressed the majority sentiment on this topic.

The committee was chairmaned by E. N. Avegno, New Orleans Public Service Inc., New Orleans, La.; the members being N. A. Newton, Oklahoma Natural Gas Co., Tulsa, Okla.; and J. F. Orr, Houston Gas and Fuel Co., Houston, Texas. Its resolution, as adopted, declared gas companies generally must merchandise appliances and should carry on sales activity in such a way as to encourage and assist other dealers in their efforts to sell approved appliances.

After the opening remarks of Mr. May at the first day's session, the conference launched promptly into consideration of dealer cooperation, with F. L. Chase of Dallas, vice-president of the Lone Star Gas Co., delivering a spirited impromptu discussion of the subject: "The Executive's Viewpoint Towards Sales Departments."

A strong affirmation of the gas companies' obligation to merchandise appliances was made by H. C. Davidson, secretary of the Consolidated Gas Co., New York, who declared that such sales by utilities are promotional, tending to increase uses of gas, and in fields which the ordinary appliance dealer likely would not enter.

Wisconsin has enacted a law completely divorcing appliance sales from gas or electric operations, Mr. Davidson stated.

"The appliance sales of the utilities are looked upon as merchandise sales that might otherwise have been made by the trade or local merchant," he said. "The agitators ignore the fact that the larger part of the expense of the utilities is directed to extending the market into fields in which the plumber or dealer could not possibly afford to pioneer."

Mr. Davidson's paper appears elsewhere in this issue.

Class Rates

Precedent for class rate structure is to be found in the experience of electric utilities, H. E. Meade of the New Orleans Public Service Inc., told the conference in a discussion of "Class Rates for Promoting Commercial Sales".

J. W. WEST, JR.
Secretary, Commercial Section, American Gas Assn.

E. J. STEPHANY
Secretary, Natural Gas Department, A. G. A.

Mr. Meade brought out the fact that the problem of every gas company is to develop the greatest amount of profitable business which the territory offers, and if a single rate built on a basis of load characteristics does not do this, due to some peculiarity of the territory, some other form might be adopted. A rate is none the less competitive because it embodies investment protection, Mr. Meade believes.

House Heating

Business of gas companies through sale of house heating equipment has been left largely to develop itself, C. K. Patton of the Texas Cities Gas Co., Dallas, pointed out in a discussion of "Selling House Heating in the Southwest".

In towns where natural gas has only recently been introduced, its use for house heating is much further advanced than in most of the cities where it has been available for many years, he said. Mr. Patton illustrated his talk by citing his company's experiences in El Paso and Waco.

Analysis of the problem is the most important factor in proper development of this phase of the work, he continued.

"What can be done in one community cannot be done in another, and by this I do not mean accomplishment of objectives, but more particularly the application of appliances," he declared. "For example, we have many communities in the Southwest where central heating plants do not exist. On the other hand, against this we have a great many communities where central heating plants do exist in various proportions."

Education of architects and builders is one of the biggest opportunities for southwestern gas companies, Mr. Patton pointed out.

Industrial Sales

Methods of securing industrial business were discussed by J. B. Allison of the Kansas Pipe Line & Gas Co., Salina, Kan. Mr. Allison cited various methods of determining industrial rates, including that of making comparisons on a basis of the amount of money actually paid by the customer in employing a competitive fuel for a certain task.

Sales Compensation

Regular salesmen prefer the commission plan of pay, in the opinion of P. C. Tucker, of the Arkansas Power & Light Co., Pine Bluff, Ark., in discussing "Methods of Compensating Salesmen in Smaller Communities".

A fair average for the regular salesman of his firm, working on the basis of $25 per month salary, 10 per cent commission on appliances and 5 per cent commission on burner sales and house piping contracts, is $235 per month, he said. Each sale is carefully checked to make sure the salesman is entitled to the commission.

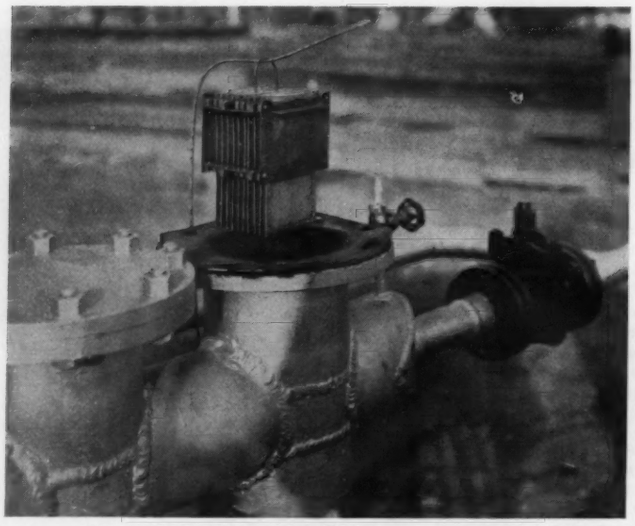
In larger towns, where his own firm operates, the salesmen are paid $50 per month salary with 10 per cent commission on all merchandise sold, E. L. Dunagan of the Oklahoma Natural Gas Co., Tulsa, Okla., told the conference. He stated that the biggest asset of the gas company is its good-will, and if in its compensation plan it wears down and destroys the good-will building elements of a salesmen's work, it is making a serious mistake. Mr. Dunagan believes that the ideal compensation plan of the future will be a blending of a straight salary and a straight commission into some simple and effective bonus arrangement which gives the salesman the opportunity he seeks and gives the company the reduced selling expenses it must have.

E. C. Whitcomb of the Fort Worth Gas Co., Fort Worth, in his paper on "The Gas Industry versus Electric Merchandising", stated that gas men have failed to develop the sales of their product because the natural advantages of gas resulted in a great and immediate demand. The electric industry, on the other hand, did not have an immediate market, and therefore to advance had to merchandise its commodity.

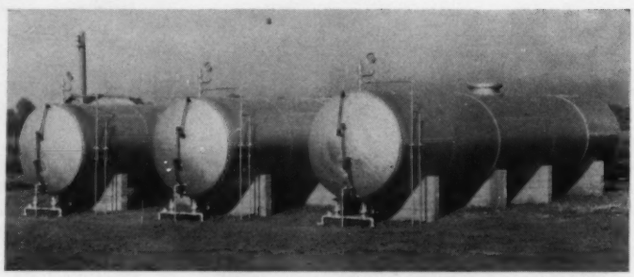
Sales of the home service department include both the tangible and the intangible, the latter consisting chiefly of good-will and increasing consumption on the part of the individual customers, Miss Albertine Berry of the San Antonio Public Service Co., San Antonio, told the conference.

C. B. Wilson of the Southern Cities Distributing Co., Shreveport, La., told of domes-

(*Continued on Page 60*)



BELOW:
Odorant storage at Milpitas, Calif., filled from tank cars 1½ miles away by pipe line and motor driven pump; capacity of three tanks, 19,000 gallons.



ABOVE:
Showing wicks and cage removed from pot, in the wick-type odorizer designed by Pacific Gas and Electric Company.

ATOMIZING *and*

(*Continued from*

of 50 feet per second; unprejudiced observation indicated a drop diameter about equal to that of the shank of a common pin (0.03 inches). This agrees with the computed drop size very well. When the velocity was raised to 100 feet per second the gasoline was atomized and at 150 feet per second took on the appearance of a fog. Strangely enough these values almost coincide with those derived by calculation also, as will be seen by referring to Fig. II.

Knowing the minimum velocity for a permissible spray a relation can be drawn between this limit and pipe line pressure, thus deriving data, experimental values of which are inconveniently determined. At 50 feet per second, Fig. II, a point may be plotted on the air-gasoline curve. This fixes the maximum drop size of a fine spray and a vertical line through this point gives the minimum gas velocities for different line pressures. These values are plotted on Fig. III.

At this time it must be mentioned that the capacity of a nozzle tip was limited; with too high an effluent velocity slopping occurred. The test apparatus was very critical of course, because of its small throat. With a larger throat the probability of a drop being deflected to the walls would be much less, since the drop according to the previous theory would be torn to its equilibrium size before this distance could be traversed. The maximum entering fluid velocity was determined for various air velocities; this is shown by the dotted curve in Fig. V. It seems conservative to assume that the denser the gas stream the higher will be the allowable effluent velocity, since the shear would vary with the density of the gas stream. Consequently the relation between gas pressure, gas velocity, and effluent odorant velocity has been evaluated in Fig. V—from the natural gas curve at atmospheric pressure which also has been derived through a density relation from the air curve.

The nozzle tips, in an odorizer, do not function in a metering capacity. Therefore, the head necessary for a nozzle tip delivery is confined to within 2 feet or the effluent velocity to within 7 feet per second. The apparatus is compensated for heads up to this value.

Design of Odorizer

The data given are sufficient for application to design. In a practical problem the minimum and maximum gas flows are known as well as their respective pressures. The Venturi throat diameter can then be determined.

On Fig. III the minimum gas velocity for a fair spray is found for the line pressure at minimum flow and substituted in the formula.

$$D = 0.226 \left(\frac{Q}{Nv}\right)^{1/2} \qquad (3)$$

Where
D = Diameter of throat in inches,
Q = Cubic feet of free gas per hour,
N = Gas pressure in atmospheres absolute,
v = Gas velocity in feet per second at the throat.

In the odorizer, as described, a small orifice meters the odorant proportionally by means of the Venturi differential. This orifice bears a definite relation to the Venturi throat.

$$d = 0.002063\ DN^{1/4}\left(R\frac{C}{c}\right)^{1/2} \qquad (4)$$

Where
d = Diameter of oil orifice in inches,
R = Odorant oil rate desired in gallons per M.M. cu. ft. of free gas,
C = Discharge coeff. of Venturi (0.90 with nozzle inserted),
c = Discharge coeff. of orifice (0.61 for sharp edge).

(Note: The formula ignores the velocity of approach in the Venturi, since in practice the throat is small enough to render it insignificant.)

While very high gas velocities would seem ideal from an atomization standpoint, yet more reasonable ones are better since the orifice diameter is a function of the throat diameter and must be as large as possible to prevent fouling. In fact, this constitutes the main limitation on the smaller odorizers.

The number of nozzle tips required is based upon the maximum odorant flow contemplated. The capacity of one nozzle tip may be found from Fig. V for different gas velocities and pressures.

The atomizing odorizer is best suited for large flow installations. No attempt has

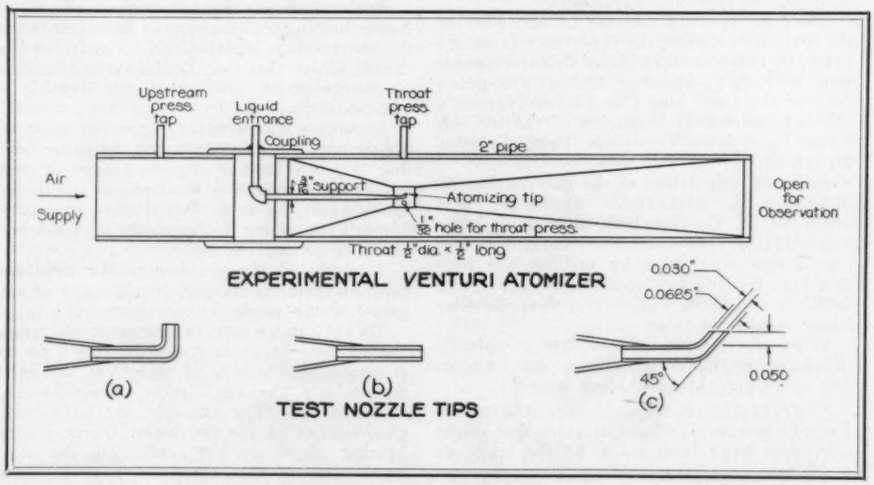


FIG. IV.

WICK *Odorizers*

Page 27)

been made to apply this type to flows below a minimum hour of 2500 cubic feet. At this delivery, with a line pressure of 60 pounds and a minimum gas velocity of 21 feet per second, the odorant orifice is but 0.01 inches in diameter. No trouble, however, has been experienced with even this small an orifice, the velocity through the adjacent piping being so slight that turbulence does not exist to agitate sediment.

The Milpitas odorizing station shown in the photographs might be considered an ideal application of this odorization principle. The flow in the San Francisco tube averages 1,800,000 cubic feet of free gas per hour at 135 pounds gauge at the writing of this paper. This gives a gas velocity at the Venturi throat of 105 feet per second.

Referring to Fig. II it will be noticed that perfect fogging can be expected, the drop diameter being about 0.001 of an inch. If an ordinary drop of odorant, such as would fall under the influence of gravity from a dropper at atmospheric pressure, be considered as having a diameter of 0.15 inches, the surface of an equivalent amount of odorant atomized to this degree would present 150 times the evaporating surface. Couple with this the fact that the fog, upon reaching the end of the Venturi, is distributed over the entire pipe section and the advantage of this form of introduction is realized. The odorant metering orifice on this line has a diameter of 0.0818 inches, which makes fouling quite improbable.

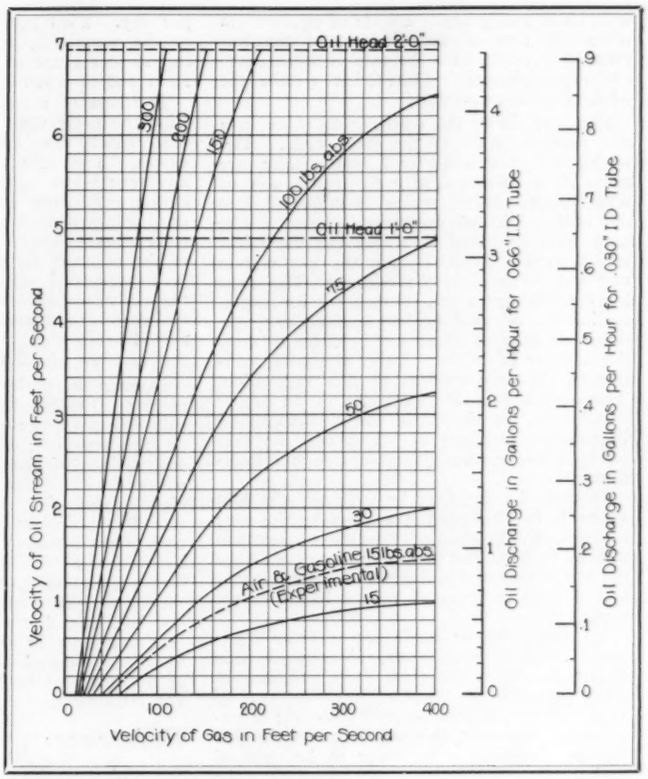


FIG. V. Maximum oil nozzle velocity and discharge in terms of gas velocity and pressure for complete atomization of odorant oil in natural gas.

Wick Odorizer

As previously mentioned, the atomizing odorizer was not practical for flows below 2500 cubic feet per hour. Consequently it was necessary to develop a small odorizer for towns having a lesser load. To meter such small amounts of odorant was out of the question and efforts were directed toward a wick odorizer. This had been tried before by M. T. Burton of the Southern California Gas Co. and the idea discarded mainly because of dust and moisture trouble. It is evident that dust would soon clog a wick chamber and that water, being denser than odorant, would travel down the wick, displacing the odorant. Fortunately, neither existed appreciably in the lines of the Pacific Gas and Electric Co.

As a preliminary study, the rate of evaporation from a wick was determined. The wick, 1 inch wide, was supported vertically in the center of a ⅝-inch by 3-inch conduit 18 inches long laid on edge horizontally. The plane of the wick was parallel to the gas flow, its effective area being 3 square inches on each side. A slot, ⅛ inch by 1 inch, in the bottom of the conduit as well as in the top of a container directly below gave the free end of the wick access to odorant oil. By carefully measuring the odorant depletion and the gas flow through the conduit Fig. VI was developed. Excessive gas velocities were not contemplated, the maximum being 4 feet per second. Line pressure was considered as affecting evaporation inversely, though admittedly the surface film reduction with an increase of density should improve the rate. Fig. VI then became the basis for wick odorizer design. The problem resolved itself into proportioning the wick passages for a gas velocity of 4 feet per second at maximum flow and providing wick area enough to give the necessary odorant evaporation.

It is natural for fractionation to take place in this type of apparatus. However, the

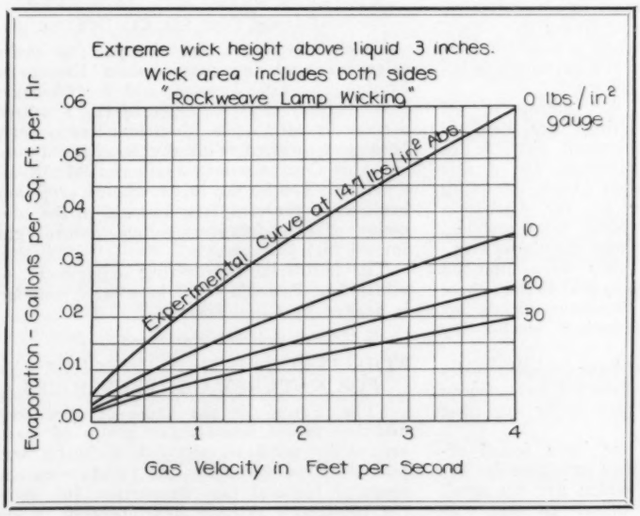

Extreme wick height above liquid 3 inches.
Wick area includes both sides
"Rockweave Lamp Wicking"
0 lbs/in² gauge
10
20
30
Experimental Curve at 14.7 lbs/in² Abs.
Evaporation - Gallons per Sq. Ft. per Hr.
Gas Velocity in Feet per Second

FIG. VI. Odorant evaporation from wicking in terms of gas velocity at 60° F.

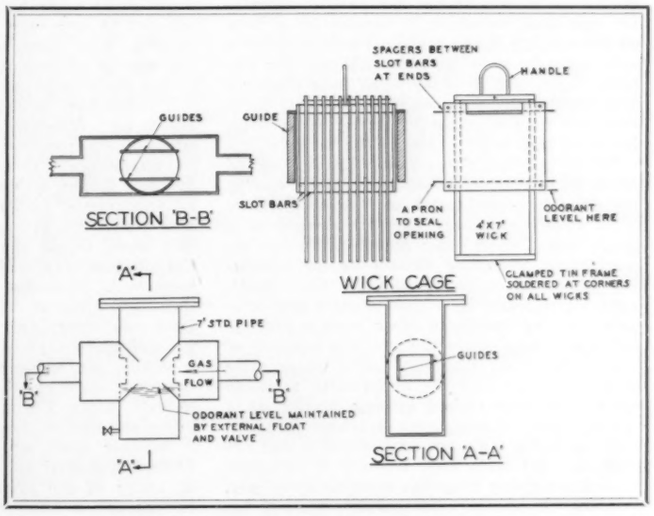


FIG. VII. Diagram of wick-type odorizer, in use at several points on P. G. and E. system.

wick must finally reach a state of equilibrium when the rate of vaporization of the less volatile fractions fixes the rate of fresh odorant replenishment. Convection within the wick is quite impossible.

Fig. VII shows the odorizer in place in a gas line, as well as the wick cage. The wicks, 4 inches wide by 7 inches long, are made rigid by means of a tin frame, pierced with ragged holes, which is clamped onto the wick. The wicks resemble cards. The cage with its many slots receives the wicks which extend 3 inches into the gas stream and 3½ inches into the odorant. The cage itself constitutes a gas conduit for its length, sealing the odorant against surface evaporation, and may be lifted out in order to vary the number of wicks. This, of course, constitutes the only method of fine regulation. Three wick pots are in series in an actual installation, as shown in the accompanying illustration, any one of which may be shut off by a valve, thus affording rough regulation.

In case the gas flow be very light a float valve is not included, the level in the pots consequently dropping. Weekly filling then suffices to keep the odorizer operative, since the wicks extend 3½ inches into the odorant and a drop in level of 1 or 2 inches is not serious.

No claim can be made for accurate regulation with this odorizer, although a fair degree should be expected. The gas temperature naturally has some effect on the rate of evaporation. Where odorant metering is impractical, however, this odorizer is attractive for its simplicity. In order to be sure of satisfactory odorization at all times, the average quality introduced is somewhat higher than with the other type of apparatus, where the control is quite accurate.

The Pacific Gas and Electric Co. operates 17 odorizing stations at present. This multiplicity is unavoidable, due to unodorized gas contracts. Eleven of these apparata are of the atomizing type, the capacities varying from 60,000 to 40,000,000 cubic feet of gas per day. Two stations are being converted to the atomizing type. The four remaining apparata are of the wick type, handling from 600 to 8,000 cubic feet per day.

The cost of an atomizing odorizer is but slightly more than for the dropper type, the Venturi tube and nozzle being the only extras. The other parts are necessary for any type when regulation is expected. Accurate regulation under ordinary variations of load, when supplying distribution systems directly, will save about 24 per cent of the odorant as compared with a constant feed apparatus set to an average rate for the daily period. Considering the offensive nature of the odorant it is better to provide considerable high pressure storage to reduce the number of filling operations.

During the period when the odorant was merely dropped into the pipe lines considerable drippage occurred. One drip alone on the outskirts of San Francisco yielded 400 gallons of the less volatile fractions of odorant oil. This oil had traveled past eight drips for 45 miles. Condensation would not account for this since temperatures were constant and pressures were one-half those at the odorizing station. Imperfect regulation and mixing was no doubt the cause. Analysis of data on drip recovery indicates that since the atomizing odorizer has been in use the amount recovered has been reduced from in the neighborhood of 3.5 per cent to 0.4 per cent of the odorant introduced.

References

1—Western Gas, Sept., 1930, Pg. 111.

2—Oscar C. Bridgeman, S.A.E. Journal, Nov., 1928, Pg. 478.

3—Ind. and Eng. Chem., June, 1923, Pg. 592; Ibid, Dec., 1925, Pg. 1287.

4—G. B. Upton, Sibley Journal Eng., Jan., 1923, Pg. 2.

5—Blackwood and Exline, Ind. and Eng. Chem., Dec., 1929, Pg. 1258.

Sales Organization *for* Small Gas Properties

(*Continued from Page 31*)

Happily the latter type cases are exceptionally few. We have always felt that it required little ability on our part to dismiss an employee, whereas it savors of a true understanding of the problems before us to be able not only to select good material for our sales force, but to train those men properly and adequately, and lastly, to so locate them that we may be able to secure from them the very best services they have to give.

While we have a regular sales force of about 50 persons at present, due to our operations being spread over so vast a territory it is vitally necessary that we depend to a great extent upon other members of our organization, generally known as the operating force. In order to stimulate their interest we frequently have special sales and offer prizes to the employee other than a regular salesman, who closes the greatest number of sales. Realizing that this might place some employee who had the enthusiasm to make sales, but who lacked closing ability at a distinct disadvantage, we arrange to credit this employee with one-half the sale and the salesman the other half when it is necessary to call a regular salesman in to close the sale.

Since all of our salesmen are paid a flat salary and are not dependent upon commissions for their compensation, they are left free from the usual petty controversies regarding commissions and can and do willingly assist other employees in closing sales, without in any way jeopardizing their own income. This seems to create a friendly feeling among all employees and certainly to increase their cooperative efforts.

To further increase the interest of all employees, frequent meetings are held at which the employees of several districts are in attendance. These meetings are a sort of open forum, where each person attending is encouraged to bring up for discussion and assistance, his individual sales problem. We have found that these meetings serve the purpose for which they were intended very well. (I would like to add that at these meetings none of the company officials attend, as they are altogether work-a-day gatherings.)

While we sometimes have regular sales meetings, these meetings which I have chosen to call "Open Forums" are really our most effective sales meetings.

Another plan which we have found effectual is that of appointing merchant dealers in many of the towns which are too small to support a company office. In this way we are able to maintain a merchandise display and give our small town consumers the same advantages that we offer in the larger towns, without disproportionate expenses.

We secure those merchant dealers by entering into an agreement to pay them a percentage on every appliance which the gas company sells in their town, regardless of who makes the sale. Should they themselves make the sale they naturally receive a larger percentage. In all cases all installation, accounting, collections, etc., are handled by the gas company through the office having jurisdiction.

Thus we are able to display gas appliances of the type approved by the A.G.A. in many of the smaller communities, which otherwise we would not be able to do.

Another matter which may at first seem trivial is that of sending out to the field, immediately after the close of each month, a list showing the standing of each reporting office, as regards the volume of sales, as well as a list showing the standing of each salesman.

Both of these lists are only relative—i.e., the offices and salesmen's names are listed in order of their volume of sales, but with no figures.

It is interesting to note the enthusiasm displayed upon receipt of these lists, and many a time a district has "declared itself" at that moment—and started with grim determination to rise above some other district next month.

It is also a pleasure to note the remarks of different employees regarding their own efforts toward raising the standing of their resident salesman.

At the present time with two space heater crews working in the properties we send out each week a list showing the relative standing of each member. Each week three prizes are awarded, $5 to the member making sales of the largest amount, $3 to the next and $2 to the next. This gives added impetus to the work and added interest as well.

As outlined in the foregoing, we have built up a spirit of cooperative effort among our employees and welded them to our sales force in a manner which, judging from figures obtained from our sales sheets, leads us to believe that we are working along the right lines. I say this in view of the fact that regardless of much talked of "adverse business conditions" we have been able to increase our appliance sales steadily each month over the preceding one.

CHARLES REMSCHEL IS POWER ENGINEER FOR SO. COUNTIES

Charles Remschel, for the past 10 years sales manager for the Western Enterprise Engine Co., Los Angeles, and for 10 years prior to that sales manager of the Southern Sierras Power Co., in Riverside, has recently become associated with the Southern Counties Gas Co., as power engineer. Mr. Remschel will handle the large volume of power business of the company, and aid in the education of manufacturers to use natural gas for all fuel purposes.

The industrial engineering department, of which Mr. Remschel will be a staff member, is headed by C. L. Ferry.

"THE TORCH" IS NEW HOUSE ORGAN FOR NATURAL GAS PROPERTIES

"The Torch" is the name of the latest addition to the house-organ group of western utility publications. Vol. 1, No. 1 was published on November 19, and contained news of Natural Gas Properties, Inc. from the company's Oregon developments in the north to its southernmost properties at Calexico and Brawley, California.

Northern Natural Making Headway *on* Major Carrier

NORTHERN Natural Gas Co. is rushing to completion the 620-mile line from the Aramillo field to points in Iowa. The company is now operating to deliver natural gas to 30 towns and cities in Nebraska, including Lincoln and Beatrice, and is also delivering gas to the city of Council Bluffs, Iowa.

Construction work under way involves the building, by sections of a 24-inch line, and extensions to Sioux City, Fort Dodge, Mason City and Des Moines, bringing the total mileage of the line to about 725.

The 120-mile extension to Sioux City is practically complete, and is being constructed of 16- and 20-inch pipe.

The Fort Dodge-Mason City line, consists of 85 miles of 20-inch pipe, and is expected to be complete before December 31.

Construction of the Des Moines extension is to begin early in the new year. The construction program does not contemplate serving of Texas gas until the completion of the entire line. Arrangements have been made with the Kansas Pipe Line & Gas Co., for transportation, and service will be maintained in Nebraska and Iowa by that arrangement until the completion of the major project.

NORTHWEST OIL & GAS ASS'N. IN FIRST ANNUAL CONVENTION

Northwest Oil & Gas Association held its first convention in Seattle, Wash., November 7 and 8. Sessions were attended by men interested in oil and gas development throughout the Pacific Northwest, and from British Columbia. Ed. A. Sims, of Port Townsend, Wash., is president of the organization, and serving with him on the board of directors are Col. William T. Perkins, C. S. Shippey, R. B. Newbern, Dan North, Judge L. W. Mathews, M. E. Hay, and Dr. Howard E. Culver, geologist for the state of Washington. Officers, in addition to Mr. Sims, are: Milton S. Hurwitz secretary; Roger D. Pinneo, treasurer.

The two days were devoted to discussion of oil and gas problems as particularly applicable to the northwest territory, where many development projects are reported.

COURSE IN SALES ADMINISTRATION AND MANAGEMENT

Announcement has been made of the inauguration, beginning November 15, 1930, of "Sales Administration and Management in the Gas Industry," a course of study based upon a survey by the American Gas Association. This course of study is designed for executives in charge of sales, sales managers, branch managers, sales supervisors, and all others having any part in sales administration and management—domestic, commercial or industrial. Registrations for the course are being accepted at a fee of $50 each by J. W. West, Jr., Secretary, Commercial Section, American Gas Association, 420 Lexington Avenue, New York, N. Y.

LOOMIS, NEB., GRANTS FRANCHISE TO CITIES SERVICE GAS CO.

Loomis, Neb., has granted a franchise for the service of natural gas to the Cities Service Gas Co., Kansas City, Mo. Service will come from an extension of the Lyons to Superior line, recently completed.

BUTLER FRANCHISE GOES TO THE WESTERN SERVICE CORP.

Western Service Corp., Oklahoma City, Okla., has been granted a franchise for the service of natural gas in Butler, Mo.

Sketch of the natural gas system in the Fresno district. Broken line shows projected carrier from Fresno to Merced, and also line to be constructed from Kettleman Hills field to augment the supply in the Fresno district.

Merced Extension *with* Kettleman Tie-In Planned *by* P. G. *and* E.

PACIFIC Gas and Electric Co., San Francisco, Calif., is beginning construction of a 61-mile extension from Fresno, through Herndon to Merced, and will also construct a direct line from Kettleman Hills gas fields to link up with the new carrier.

From the terminus of the Southern California Gas Co.'s line in Fresno, a new 8-inch high pressure main will be extended approximately 6 miles north from the city, and a 12-inch line will be extended from that point for 8 miles to Herndon. From Herndon, the contemplated line extends in a general northwesterly direction, adjacent to the state highway, for a distance of approximately 47 miles, to the gas plant in the city of Merced. The line from Herndon to Merced will be of 8-inch pipe. The development is expected to cost in the neighborhood of $670,000 and will be ready for service early in the year.

The San Joaquin Light and Power Corp.'s steam electric generating plant now under construction at Herndon is to be served through the extension.

A direct line from Kettleman Hills fields to the new carrier is also projected to augment the natural gas supply for Fresno, the Herndon plant, and the Merced extension. This work will start when construction on the other line is well under way, since the Kettleman line is not intended to go into service until completion of the electric plant. Approximately $700,000 will be invested in the line from the gas fields.

CONNER ON COAST IN INTERESTS OF INSPECTION STATION

R. M. Conner, director of the American Gas Association testing laboratory at Cleveland, is spending several weeks on the Pacific Coast in the interests of establishing a permanent inspection station in that section. He arrived in Los Angeles on November 19, and is planning to spend considerable time in northern California and in the Pacific Northwest before his return to Cleveland late in December.

MISSOURI ASSOCIATION OF PUBLIC UTILITIES TO MEET APRIL 16-18

The annual convention of the Missouri Association of Public Utilities will be held on April 16, 17 and 18, 1931, at Excelsior Springs, Mo.

Angle made with factory bends.

Angle made with expansion joint.

Pipelining *in* Rough Terrain

(*Continued from Page 29*)

supporting both the new 22-inch line and the 12-inch Taft-Los Angeles line.

Through the Sepulveda Tunnel for a distance of about 740 feet the 26-inch line was encased in a 30-inch casing, which was also made up in 40-foot lengths. In order not to damage the protective coating on the 26-inch pipe a joint of 30-inch casing was slipped over each joint of 26-inch as soon as it had been welded to the previous joint, and the protective coating applied. While this method was slower than welding up the 26-inch pipe and pulling it through the 30-inch casing, it was considered advisable in order to protect the coating properly.

Where the line crossed marshes and small canyons it was supported on standard construction A frames.

Valves and Fittings

Lubricated venturi-type plug valves were used throughout the entire project and as a general rule they were placed about 3 miles apart, except in the mountain sections where they were located so as to be easily and quickly accessible in case of emergency. Six-inch blow-off gate valves were located on each side of the main line valves.

Three-inch connections were left in low places on the main line as possible future connections for drips.

Concrete Vaults

Concrete vaults were constructed at all main line valves. Where valves were located on dedicated streets and highways, vaults with concrete tops and cast iron manhole covers were used. Open top vaults were used on private property.

In both types a sleeve was used in the walls of the vault through which the pipe was passed.

Testing

Testing of the finished line was done with either air or gas, whichever was most convenient or advisable. Two tests were made, the first at 100 pounds pressure on the skids and the second in the ditch after backfilling the trench. The second test was made with the highest pressure available, which varied from 200 pounds to 350 pounds. On the first test all joints were soaped and after blowing down the line and repairing the leaks the line was lowered. After backfilling the trench the highest available pressure was put on the line and the section under test was walked to find if any welds had been broken in lowering. A recording pressure gauge was also put on the section under test for 48 hours to determine if the section showed any pressure drop.

It is interesting to note that on the entire 72 miles no leaks were found after the first test, and only one weld was broken in lowering the line. Internal expansion test heads were used on all sections.

Backfilling

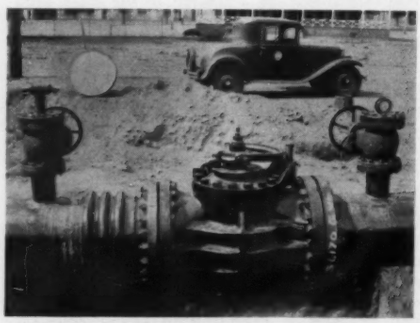
Whenever possible backfilling was done with caterpillars equipped with backfiller

Preparing to place a 26-inch fitting under an existing substructure.

blades, but in the mountain sections where a grade had been built and the spoil leveled off for equipment to work on, considerable backfilling was done with power shovels. These shovels worked on the leveled off spoil bank and cut into the bank for material with which to fill the ditch.

Measurement Stations

Measurement stations were built at West Los Angeles, at the intersection of Ventura Boulevard, and at Newhall.



Typical main line valve installation.

Orifice meters were installed at all measurement stations, and at the Newhall station provision was made for odorizing the gas.

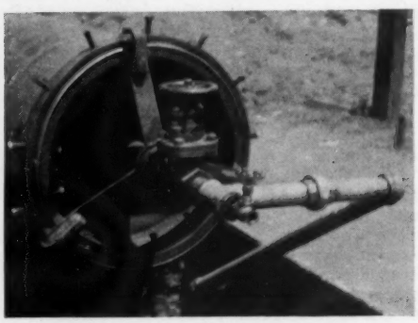
Conclusion

All work on this project was done by contract, but before letting any contracts the manner of doing the work was carefully considered and provision was made for many possible contingencies.

The Southern California Gas Co. maintains a field organization on sections of this project at all times to see that proper construction methods were used and to assist the contractors in all ways possible, and also make decisions on matters that continually arise on such projects. Much of the progress and speed made in this construction was undoubtedly due to the help this organization was able to give the contractors and the cooperation that existed throughout this project between the gas company field organization and the contractors.

Construction work was started about the middle of July, 1930, and completed on schedule, late in October.

In addition to the above project the Southern California Gas Co. also constructed 5½ miles of 16-inch outside diameter pipe from Compressor Station No. 50 in Ventura to connect with its existing 12-inch Ventura-Castaic line at Mills and Telegraph Roads. The route of this line is on private property over very rough terrain. "Smithwelded" pipe was also used on this line, furnished with bell ends, having the same specifications as the pipe used on the major project. The new process of acetylene welding was



Test head installed on end of section ready for testing.

used on this section. No unusual difficulties were encountered on this portion of the work and standard pipe lining methods were used throughout.

HOLDER CONSTRUCTION PROGRAM COMPLETE AT POMONA

High pressure holders of the Southern Counties Gas Co., under construction for the past several months in the Pomona, Calif., district, have been completed and tested, and were expected to be placed in service some time in November, according to District Manager C. G. Spencer.

Change Over *of* North Bay Division Completed

WITH the recent completion of the change over from manufactured to natural gas of the entire North Bay Division of the Pacific Gas and Electric Co., San Francisco, Calif., the last of the present program of natural gas extension for this utility has been completed.

The transmission sections thus involved include a 35-mile line of 16-inch and 12-inch pipe from Crockett to Petaluma, a 30-mile extension up the Napa Valley from the Bay to Napa, St. Helena and Calistoga, a 7-mile extension up the Sonoma Valley through Sonoma to Glen Ellen, and a new 6-inch line from Santa Rosa to Healdsburg, connecting with the old Petaluma to Santa Rosa line, which was already in service.

From Petaluma, natural gas was brought through the existing mains down through Novato and into San Rafael, from where it is distributed to all Marin County points.

HUNNEWELL AND SO. HAVEN NOW OWNED BY PUBLIC UTIL. INV. CO.

The gas division of the Public Utility Investment Co., Salina, Kan., has purchased the natural gas distribution systems at Hunnewell and South Haven, Kan. The towns are both served from the major carrier of the Consolidated Gas and Utility Co. from the panhandle in Texas to Wichita and other points in central Kansas. The new additions to the company system will be operated as units of the Western Natural Gas Co., under the direction of Elmer Sanders, manager at Caldwell, Kan. The South Haven plant is about three years old, and in good condition, while the Hunnewell plant and distribution system will be rebuilt and changed from a low pressure to a high pressure unit.

RATE REDUCTION MAY GO INTO EFFECT FOR L. A. G. AND E.

A 9 per cent reduction in rates may go into effect for the Los Angeles Gas and Electric Corp., as a result of the November 25 decision of the California Railroad Commission. The Commission provided for an optional reduction of 7 per cent instead of 9 per cent, as a trial measure for the year 1931, with additional provisions relating to the establishment of a temperature reserve to guard against violent fluctuations in earnings due to unseasonable weather.

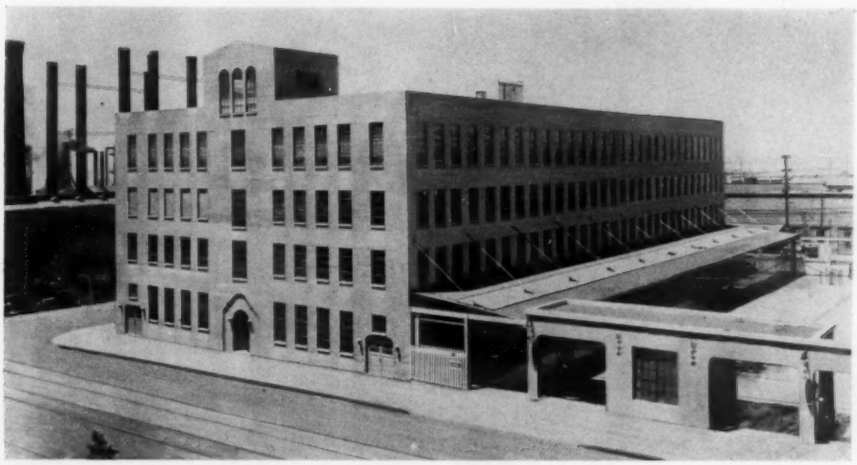
January 1, 1931, is the date set for application of the new schedule. Whether the corporation will file a rehearing petition, or seek invalidation of the commission order through appeal to the courts has not yet been indicated.

C. B. GAMBLE NAMED VICE-PRES. OF MINNEAPOLIS GAS LIGHT

Charles B. Gamble, general superintendent of the Minneapolis Gas Light Co., Minneapolis, Minn., and manager of its production and distribution departments, has been named vice-president of the company, according to an announcement made early in November by John K. Swanson, vice-president and general manager. Mr. Gamble has been with the company for the past 20 years.

WYMORE TO CONSIDER GRANTING OF NATURAL GAS PERMIT

United Gas Service Co., Bartlesville, Okla., has applied to the city of Wymore, Neb., for a natural gas franchise. The permit would be exercised through use of gas from the Continental Construction Co. line from Amarillo fields to Chicago.



Recently completed $350,000 service building of San Diego Consolidated Gas and Electric Co., San Diego, California.

A Modern Service Building

By RUTH E. CREVELING

San Diego Consolidated Gas and Electric Company

SEVERAL operating departments of the San Diego Consolidated Gas and Electric Company are now housed in a new service building costing $350,000. This building is four stories in height and occupies in length the entire block on Imperial Avenue between Ninth and Tenth Streets. It is slightly less than half a block wide. With the exception of offices at the west end for stockkeeping department, order, receiving and shipping clerks, the entire first floor—approximately 20,000 square feet—serves as the main stockroom for materials used by the gas distribution and electric distribution departments. There are eight racks 10 feet high and 27 feet wide, containing 2,364 bins and 352 drawers, or a total of 10,230 square feet of bin frontage.

A monorail of 1-ton capacity makes a complete loop of the first floor and also operates within the elevator. This is an electrically operated crane which runs on an overhead rail, making possible the moving of material from any location inside to trucks spotted on either side of the building.

Along the entire south side is the gas loading platform; on the north side the electric. Each foreman's truck is assigned a permanent berth along this platform. The wide marquis or canopy makes it practicable to store all operating trucks here instead of several hundred feet away in the garage, and here they are serviced at night. Material returned from the job to the storeroom is unloaded at night by the truck drivers and placed in the storeroom lobby. The night force checks it in and loads the truck with equipment required for the next day's work.

A stock counter runs parallel with the loading platform for a distance of 180 feet on the north side and 145 on the south.

Practically all of the second floor is devoted to wire, cables and other heavy electrical material. In the southwest corner, covering a space of approximately 40x60 feet, is the gas fitting test room. The salvage room occupies a slightly smaller area in the northwest corner.

Except for a 40x40 vault which will contain general operating department records, the third floor is occupied by miscellaneous materials such as fire brick, heavy gas fittings, boiler parts, etc.

On the fourth floor are headquarters for the storeroom office force, the gas division of the record department, gas distribution, electric distribution and gas trouble departments. A testing laboratory where pole and pipe preservation problems are dealt with, and another laboratory for determining the fitness of gas appliances are on this floor, and there also is an auditorium with a seating capacity of approximately 300, adjacent to which are dressing rooms, showers, a kitchen and a large room where refreshments may be served.

A 30-capacity freight elevator 10-feet wide and 25 feet long is in this service building. A loaded truck can be driven onto its platform and taken to either the second or third floors. As previously stated, the monorail system also runs into this cage so that heavy loads coming from the upper floors may be picked up from the elevator and carried to any desired point. In the center of the building is a combined freight and passenger elevator of 4,000-pounds capacity. An automatic passenger elevator is located in the main lobby on the Tenth Street side.

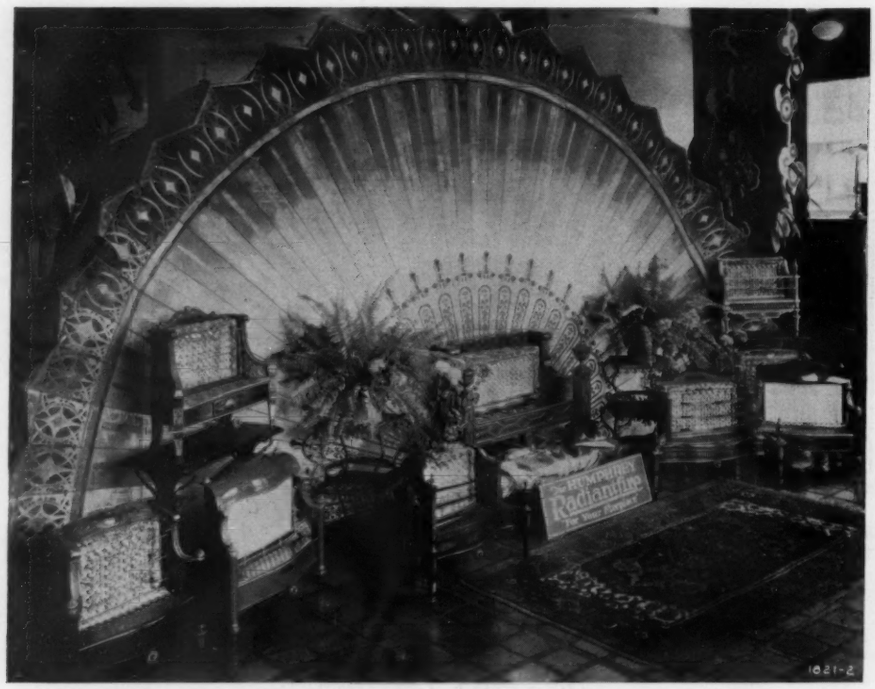
A spiral chute extending from the third to the first floor will accommodate packages up to 200 pounds.

There is on each floor a 24-inch chute direct to the basement incinerator, with a capacity of 100 pounds per hour.

To facilitate the exchange of reports and other paper work, a pneumatic tube system connects the stores accounting office on the fourth floor with the stockkeeping department office on the first.

PINE BLUFF OFFICE OF ARKNATCO HAS NEW BUSINESS DEPT.

Arkansas Natural Gas Corp., Little Rock, Ark., has recently added a New Business Department to its Pine Bluff office.



Radiantfire Display *of* Portland Gas & Coke Co.

THE new business department of the Portland Gas & Coke Co., Portland, Ore., recently placed a striking display of Radiantfire heaters, shown in the illustration above, on the company's sales floor. The fan used as a background was in shades of red and orange, representing heat, or flame. Against this vivid background the new model Humphrey Radiantfire heaters were shown to good effect. A mantel display with palms, ferns and foliage faced the lobby windows and entrance, and a miniature billboard faced toward the street, being visible from four large windows.

THIRD CONFERENCE ON BITUMINOUS COAL SCHEDULED FOR NOV., 1931

A third international conference on bituminous coal will be held at the Carnegie Institute of Technology in November, 1931, according to a recent announcement made by Dr. Thomas S. Baker, president of the Institute of Technology and organizer of the first two international congresses.

An invitation will be extended to scientists of all countries to take part in the meeting, which is the only one of its kind of international scope.

The purpose of the congress is simliar to that of the meetings held in 1926 and 1928: to present for discussion the results of recent studies of coal. Particular attention will be paid to the economics of the new methods and processes that are being evolved.

The program will include papers on carbonization, liquefaction and gasification of coal; by-products of coal; the mechanism of combustion; cleaning of coal and its preparation for the market; pulverized fuels; power plants, and domestic heating.

LAYING 26-INCH MAIN THROUGH CONGESTED CITY AREA

On November 25 the Southern California Gas Co. began construction of the 9½ mile section of 26-inch line running from the West Los Angeles Station on Sepulveda Boulevard near Pico, to Slauson Station near Slauson and Western Avenue, in Los Angeles. The line will increase delivery facilities to the southwest area of the company's system. For a 2-mile stretch the right of way runs through congested residential territory, presenting some construction conditions not often encountered in laying this size of gas main. The project represents a cost of approximately $450,000.

UNITED GAS REPORTED BUYING PART OF SO. NATURAL SYSTEM

As *Western Gas* goes to press, newspaper reports state that the United Gas Corp., headquartered at Houston, Texas, has contracted to purchase from Southern Natural Gas Corp., of Birmingham, Ala., certain of its branch lines extending from the main Southern Natural carrier to Mobile, Ala., and Pensacola, Fla. It is stated that the purchase includes branch lines to Bogalusa, La., and to Canton, Laurel, Hattiesburg, Gulfport, and Biloxi, Miss.

SPRINGFIELD GAS & ELECTRIC TO BE SERVING NATURAL BY DEC. 1

Springfield Gas & Electric Co., Springfield, Mo., expected to have natural gas service available for distribution between November 20 and December 1. The 14-inch main, taking natural gas from the eastern city limits has been completed and tested. Gas supply will come from the Cities Service line to Springfield.

MINNEAPOLIS GAS LIGHT CO. TO HAVE NEW SERVICE BUILDING

Minneapolis Gas Light Co. recently announced the proposed construction of a service building at Lyndale and Linden Avenues, Minneapolis. The estimated cost of the building is $350,000. Architect's plans for the structure are already complete.

Changes *in* Coast Counties Personnel Announced

SEVERAL changes in personnel have been announced by Coast Counties Gas and Electric Co., Santa Cruz, Calif., during the past month.

Frank Thomas, manager of the Gilroy District of the company, has been advanced to the position of division manager at Pittsburg, Calif. Mr. Thomas is succeeded by Milo Cain of Santa Cruz, illuminating engineer for the company.

M. W. Gahan, northern division manager has been transferred to the Hollister district offices in San Benito County. He will succeed H. B. McLaughlin, who is taking a leave of absence on account of ill health.

S. A. Johnson of San Francisco will take up the duties of purchasing agent replacing Earl Crick, who has been appointed assistant to Mr. Lovejoy in the customers accounting department of the general office.

Harry L. Wolf has been added to the company's staff in the capacity of assistant to W. R. Thayer, industrial gas engineer. Mr. Wolf has been with the Shell Oil Co., at Ventura, Calif., for the past four years as gas engineer. C. E. Vaughn has been advanced to the post of commercial and industrial heating engineer.

Miss Alma Freeburg, formerly of the publicity department, has been appointed to fill a similar position with Natural Gas Properties, Inc., at San San Francisco. Miss Freeburg's place with Coast Counties is being taken by Mrs. Margaret Menke, formerly of the purchasing department.

LAKEVIEW GAS CO. CONSTRUCTS BUTANE PLANT AT LAKEVIEW

The Lakeview Gas Co. has recently secured a franchise to serve the town of Lakeview, Ore., with a butane air-mixed gas. The plant is being installed, and 3 miles of the line have been completed.

B. H. Steffen, owner and general manager of the Lakeview Gas Co., was recently in San Francisco purchasing equipment for the plant.

The town of Lakeview has a population of 1,877, with 560 potential consumers. Franchise to serve the town of Alturas, California, has also been applied for by Mr. Steffen.

OKLAHOMA NATURAL MAY BUILD SECOND LINE TO SAN ANGELO

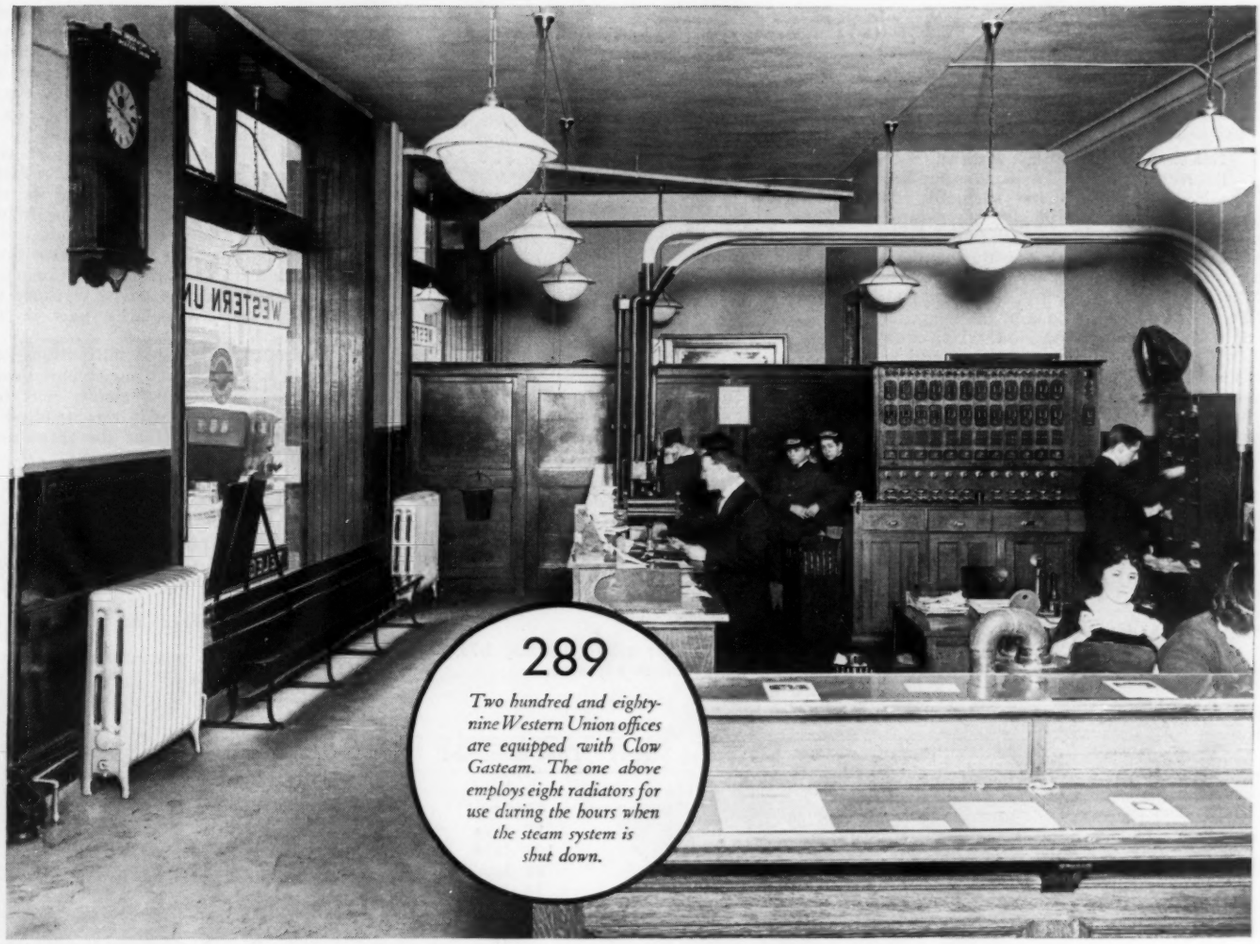
According to press reports, Oklahoma Natural Gas Corp., Tulsa, Okla., plans construction of a 12-inch line from Reagan County fields to San Angelo, to supplement the present supply of natural gas to that district. The company is said also to be planning a line from the same field to the Pecos Valley Power & Light Co.'s power station near Girvin, Texas.

NEW BRAUNFELS MADE DIVISION OFFICE FOR SO. GAS UTILITIES

New Braunfels, Texas, has been made the division office of the Southern Gas Utilities, Inc., headquartered at San Antonio. A subsidiary of Southern Gas Co., the company serves, in addition to New Braunfels, Seguin, San Marcos, Schertz, McQueeney Hondo, Converse, D'Hanis, and La Coste.

ALTMAN, TEX., GRANTS FRANCHISE TO SHAMROCK OIL AND GAS CO.

Franchise was granted recently to the Shamrock Oil and Gas Co., Shamrock, Texas, to supply the town of Altman with gas.



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Two hundred and eighty-nine Western Union offices are equipped with Clow Gasteam. The one above employs eight radiators for use during the hours when the steam system is shut down.

WESTERN UNION PICKS THIS HEATING SYSTEM

The preference for Clow Gasteam by 27 great *retail* chains as well as Western Union is ample endorsement of its efficiency.

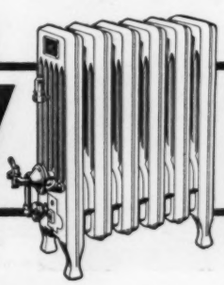
These huge organizations base their success on careful buying and low operating costs. When Western Union, Woolworth, Sears-Roebuck, or any of the many others, pick Clow Gasteam they are convinced it is the best heating system for their purpose.

Clow Gasteam Radiators present a fine appearance and take little space. Their operation is simple, to even the inexperienced. Their performance is powerful and sure. They require no intricate piping system — and so, are ideal for leased locations.

The market for Clow Gasteam Radiators is unlimited and unusually profitable. They mean a steady gas load —often an off-peak load — and a good merchandising profit in the units themselves, for the piping and installation costs are small.

JAMES B. CLOW & SONS **201-299 Talman Avenue, Chicago**

CLOW GASTEAM



Listed by Underwriters Laboratories **Approved by A. G. A. Testing Laboratory**

Analyzing *a* Major "Change Over"

By HARRY C. ROSS
Pacific Gas and Electric Company

THE change over from manufactured to natural gas of the Pacific Gas and Electric Co. system being virtually complete, it is now possible to give a recapitulation of some of the closely tabulated figures that were kept for every day during the 15 months that this activity was in progress.

The following figures are submitted which will serve to give some idea of the magnitude of the task accomplished and which establish a definite and predictable time and cost basis for scheduling change over work.

In the August, 1930, issue of *Western Gas* a detailed description of the procedure in changing over the appliances in a typical district was given. The information therein contained will be doubly valuable when augmented by the following statistics for the entire Pacific Gas and Electric Co. system, headquartered in San Francisco, Calif.:

1. Number of consumers converted:

Industrial	1,449
Domestic	438,473
Commercial and Others	35,143
Total,	475,065

2. Time allotted and required by divisions:

	Time allotted	Number of Meters	Time consumed
San Jose	28 days	44,153	31 days
Fresno	30 days	19,678	45 days
Coast Valleys	18 days	7,168	17 days
East Bay	100 days	141,656	108 days
San Francisco	70 days	188,079	68 days
San Joaquin	35 days	17,147	32 days
Sacramento	31 days	29,894	33 days
Drum	2 days	1,400	2 days
North Bay	35 days	25,890	37 days

The time allotted to the entire job was 15 months. The time for conversion in each division was determined by the completion of the transmission main to that division, which caused some lapse in time between divisions.

3. Costs of change over:

To make up an approximate total of $2,000,000, the following items contributed proportionately as follows:

Labor	$1,073,611
Transportation	99,152
Materials	411,491
Tools	27,587
Supervision	79,739
Miscellaneous	201,705

4. Man Power required:

The peak requirement of adjusters was during the change over in San Francisco, when a thousand men were employed at one time for this work.

San Jose Division, 441 men.

Fresno, Coast Valleys, Drum, Sacramento and San Joaquin Divisions, average 300 men in each instance.

5. Miscellaneous statistics:

Average premises adjust per day per man for domestic consumers, 4.2.

Average number of appliances per premise, 3.6.

Average calls for readjustments, 3.75 per cent of total premises adjusted.

Telephone system calls reached a peak of 2,515 calls in one day.

In 68 days, calls during conversion of the San Francisco Division totalled 28,369.

Over the nine divisions it required a number of automobiles varying from 18 to 114 in use at one time. A total of 824,331 automobile miles were covered during the work.

So. Calif. Companies Sponsor Cooperative Billboards

THROUGH the Natural Gas Bureau, Los Angeles, Calif., which is supported by its three member companies, the Southern Counties Gas Co., Los Angeles Gas and Electric Corp., and the Southern California Gas Co., there has been launched the first concerted billboard campaign to sell the public modern gas equipment ever attempted by the three companies. The boards are being shown from November 20 to December 26, and will appeal to the Christmas buyer pictorially to give a modern gas range as a practical present.

A total of 104 boards, half of which will be illuminated, are to be displayed. Fifty-four of the boards will be located in the city of Los Angeles, while the remaining 50 are to be distributed among the surrounding districts served by Southern Counties Gas Company and Southern California Gas Company. The name of company in whose territory the boards are shown will be a part of the poster.

The entire 104 billboards will display the same design and copy, a photographic reproduction of which is shown above. Creation of the design for the boards was handled by the advertising managers of the three companies.

BOWERSOX MANAGES DIVISION FOR NATURAL GAS EQUIPMENT, INC.

ANNOUNCEMENT is made of the appointment of George Bowersox as manager northern division, Natural Gas Equipment, Inc.

Mr. Bowersox served as utilization engineer with the Southern California Gas Co., Los Angeles, during a period of six years when conversion from fuel oil to natural gas was being made in that company's territory.

George Bowersox

During the World War Mr. Bowersox served as major in the engineering corps, following his graduation from Purdue University. He will reside at Burlingame with offices at 1123 Harrison street, San Francisco.

In addition to sales and engineering service on N. G. E. gas burners, Wilgus pressure regulators, and Anubis Differential pressure recorders, activities of the northern division, Natural Gas Equipment, Inc. which will come under the direction of Mr. Bowersox, include the Pacific Coast distribution of products of the Surface Combustion Co., Toledo, Ohio, and the Webster Engineering Co., Tulsa, Okla. Surface Combustion gas-fired industrial furnaces, Janitrol and other types of conversion burners, and Webster radiant gas burners manufactured by these companies are being installed by the N. G. E. in the northern territory.

J. E. DAVIES PLACED ON ANNUITY ROLL OF PEOPLES G. L. & C.

J. E. Davies, general manager of the Peoples Gas Stores, Inc., Chicago, an employee of the company for nearly 40 years, has been placed on the service annuity roll of the Peoples Gas Light & Coke Co.

Mr. and Mrs. Davies plan to spend the coming winter season in California, arriving at Pasadena on January 10, 1931.

NORTH BELRIDGE GAS TIED INTO SO. CALIF. SYSTEM

The North Belridge Oil Feld gas supply is being tied into the Southern California Gas Co.'s San Joaquin Valley system by a 2-mile 10-inch line now building from the Belridge Oil Co. absorption plant to connect to the gas company's Kettleman-Midway 20-inch trunk.

"Cold Air Derby" *nets* 930 ELECTROLUX *Sales*

Domestic load hits new altitude record when novel refrigeration drive of Associated Gas & Electric System piles up 16,740 MCF

EVERYONE—from file clerk to vice-president—was in on it.

Property vied with property to sell the largest number of refrigerators.

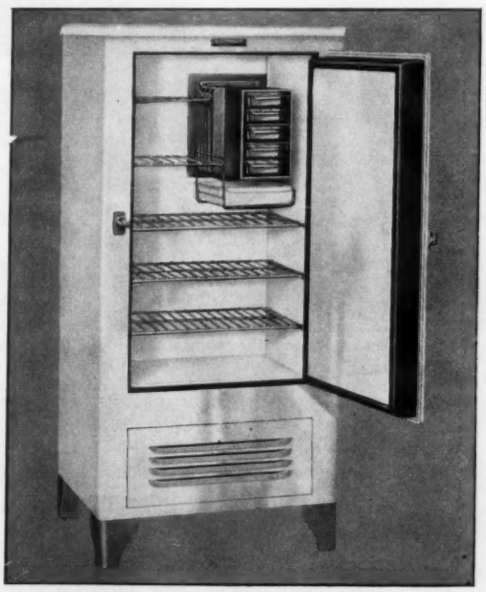
On the wall of every office hung a map. On the map were pinned miniature airplanes. Each represented a division of the Associated System. And daily, the sales progress of these divisions were chartered. Now one plane outstripped the rest in the "Cold Air Derby" to the South Pole . . . to greater sales. Now another took the lead. Competition was rife.

The campaign was backed with extensive direct mail and local newspaper advertising. Prospects were offered a special inducement to buy immediately—terms $10.00 down with 2½ years to pay the balance. Employees—exclusive of sales personnel—were given a bonus on every lead that resulted in a sale.

In six weeks, 930 Electrolux refrigerators were sold!

The campaign not only added 16,740 MCF to the yearly load. It reached many people who could not buy just then. It started them thinking seriously about Electrolux. Gas refrigeration became an immediate possibility.

For further information, write Electrolux Refrigerator Sales, Inc., Evansville, Indiana.

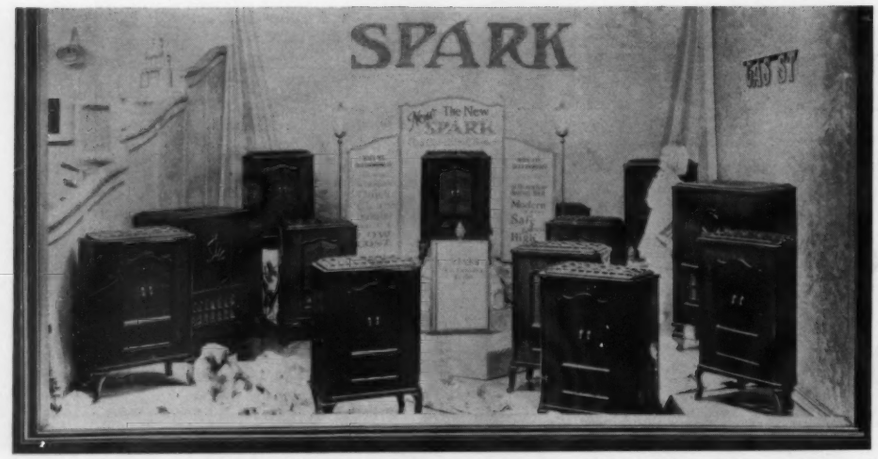


THE HOSTESS, one of the popular Electrolux models, increases your domestic load approximately 1500 cu. ft. monthly

ELECTROLUX

THE *Gas* REFRIGERATOR

A tiny gas flame takes the place of all moving parts



Natural Gas Stimulates Dealer Sales Activity

THE furniture trade of central and northern California is becoming thoroughly alive to the gas heating and cooking appliance markets opened up by general extension of natural gas service throughout that area. Typical of the dealer interest is the aggressive campaign launched by the Jackson Furniture Co. of Oakland on the Spark circulating heater. Opening in October, the campaign benefited from general publicity on natural gas development, and was encouraged by tie-up merchandising activity on the part of the Pacific Gas and Electric Co. The window display shown above was a part of the campaign promotion, in which consistent newspaper advertising was also an important element.

Reviewing *the* Southwest Sales Conference

(*Continued from Page 49*)

tic sales campaign methods, stating that one of the most successful means of utility merchandising is for the company to assign a sales representative to a certain specific geographical territory.

Radio advertising has been very effective, he declared. In cases where special inducements are offered during a sales campaign it is important, for the effectiveness of future campaigns, that the special inducement be removed after the campaign has been closed; otherwise the advertising will lose its value.

Mr. Wilson said in part:

"Basically the domestic salesman's job is similar to that of the industrial salesman. He must be able to do in the home what the industrial representative does in the shop or factory. He must be able to determine just what additional service is necessary to fill the customer's needs, and to recommend the type and kind of appliances best fitted for the purpose.

"The domestic salesman will not be able to do this intelligently unless or until he has had the right kind of training for this work. . . . He must have a background of knowledge about the industry he represents."

Installation and service departments, as well as the sales representatives, must know the firm's merchandise and make themselves enthusiastic in rendering a satisfactory service, in the opinion of S. A. Lipscomb of the Arkansas Natural Gas Corp., Little Rock.

Employee cooperation is the main problem in a company whose property consists of many small towns, pointed out S. E. Kerr, of the Community Natural Gas Co., Dallas, Texas. Among the methods suggested were exchange of employees from one district to another, and frequent meetings of employees to build a spirit of good-will and cooperation. His paper appears on another page of this issue.

On the subject of "Methods and Results of Dealer Cooperation," E. N. Avegno of the New Orleans Public Service Inc., described for the conference how the cooperating dealers of New Orleans, a committee representing the licensed master plumbers, and the company representatives, meet regularly once a month at luncheon, where problems are discussed in a friendly manner.

The Southwest Natural Gas Sales Council of the A. G. A. Commercial Section is composed of the following: Chester L. May, chairman, Community Natural Gas Co., Dallas, Texas; J. B. Allison, Kansas Pipe Line & Gas Co., Salina, Kan.; S. M. Apperson, Austin Gas Co., Austin, Texas; E. N. Avegno, New Orleans Public Service Inc., New Orleans, La.; H. P. Carroll, Houston Gas & Fuel Co., Houston, Texas; Q. R. Dunagan, Cities Service Gas Co., Bartlesville, Okla.; E. J. Hatzenbuehler, Lone Star Gas Co., Dallas, Texas; S. A. Lipscomb, Arkansas Natural Gas Corp., Little Rock, Ark.; N. A. Newton, Oklahoma Natural Gas Corp., Tulsa, Okla.; Elliott G. Peabody, Baton Rouge Electric Co., Baton Rouge, La.; R. E. Sivley, San Antonio Public Service Co., San Antonio, Texas; P. C. Tucker, Arkansas Power & Light Co., Pine Bluff, Ark.; and C. B. Wilson, Southern Cities Distributing Co., Shreveport, La.

E. J. Stephany of Dallas, secretary of the American Gas Association Natural Gas Department, served as secretary of the two-day conference.

GORDON LAIDLAW NAMED GENERAL AUDITOR FOR SALINA COMPANY

Gordon R. Laidlaw has been appointed to the position of general auditor for the Public Utility Investment Co., of Salina, Kan., taking the post left vacant by the resignation of F. G. McInnes.

BUTANE SERVICE FOR MINNESOTA AND WISCONSIN CENTERS

Service of butatne gas in towns of the Iron Range district of Northern Minnesota was inaugurated with the turning of the gas into mains at Chisholm by the Northern Utilities Co., of Chicago, Ill. The company is also installing a system in Eveleth, Minn. Other towns in this district which expect to have butane in the near future are Ely and Tower.

H. H. Hurley has acquired franchises for the distribution of butane in Breckenridge and Whapeton, and is applying for a similar franchise in Ely.

Hastings, Minn., is to have service through the mains of the Utilities Gas and Electric Co., Chicago, Ill. This company has under way construction of six other plants in the middle west, at Tomah, Waupaca, Eldorado, Metropolis, Vandalia, and New London, Wis.

APPLIANCE SALES RECORD MADE BY 13 SO. COUNTIES SALESMEN

Thirteen salesmen of the Southern Counties Gas Co., each sold $2,500 worth of merchandise during the month of October, according to a report made at the monthly sales dinner and meeting of the company held on November 20. Plans for the December sales campaign were given, with emphasis on Christmas sales.

Among speakers at the meeting was R. M. Conner, director of the American Gas Association Testing Laboratory.

JAMES BARRINGTON NAMED SAFETY SUPERVISOR FOR COAST COUNTIES

JAMES BARRINGTON has recently been appointed as safety supervisor for Coast Counties Gas & Electric Co., Santa Cruz, Calif.

James Barrington

One of the first features of Mr. Barrington's work has consisted of the holding of classes in first aid and safety training in the various districts of the company, using the Bureau of Mines First Aid Manual as a text for this work.

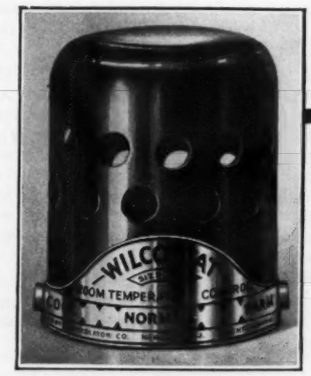
At the present time the districts are contemplating the formation of First Aid Teams for both men and women, for competitive purposes and to create additional interest in the work.

COLORADO NATURAL IN FRANCHISE ACTIVITY FOR MAJOR LINE

Fountain, and Canon City, Colo., have granted 25-year franchises recently to the Colorado Natural Gas Co., Denver, Colo. Arthur K. Lee is president of the company, which plans the construction of a transmission line from Kansas fields to Colorado Springs and other towns and cities en route. The company already holds natural gas franchises in Florence, Colorado Springs, East Canon and South Canon.

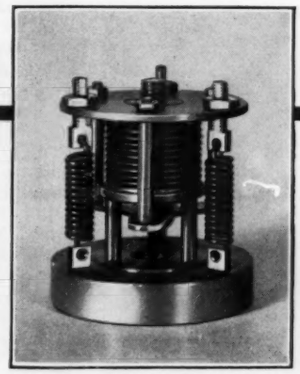
COMPLETION OF PLANT TO SERVE WORTHINGTON, MINN.

A water gas plant and gas distribution system has been completed at Worthington, Minn., and was put into operation early in December.



Decorative Cover

Liberally ventilated to insure free circulation of air at actual room temperature. Attractive lines. Easy to keep clean.



Sensitive Bellows Thermostat

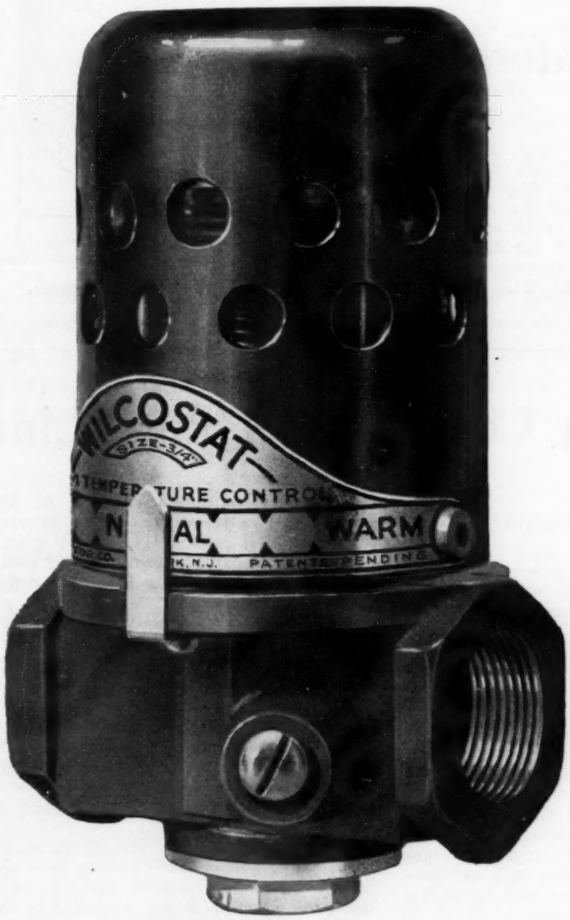
Complete assembly unit of balanced construction. Protected against abuse or straining due to over-expansion. Large movement per degree of temperature change. Responds instantly to change in temperature.

Heavy Valve Casing

Accurately machined. High pressure type valve rod. Serves as base for assembly of complete Wilcostat. Incorporated by-pass adjustment and pilot light-outlet.

Self Aligning Valve Construction

Easily removed for cleaning, if necessary. Large capacity with extremely low pressure drop.



These Features Emphasize the Superiority of

THE WILCOSTAT

Automatic Room Temperature Control

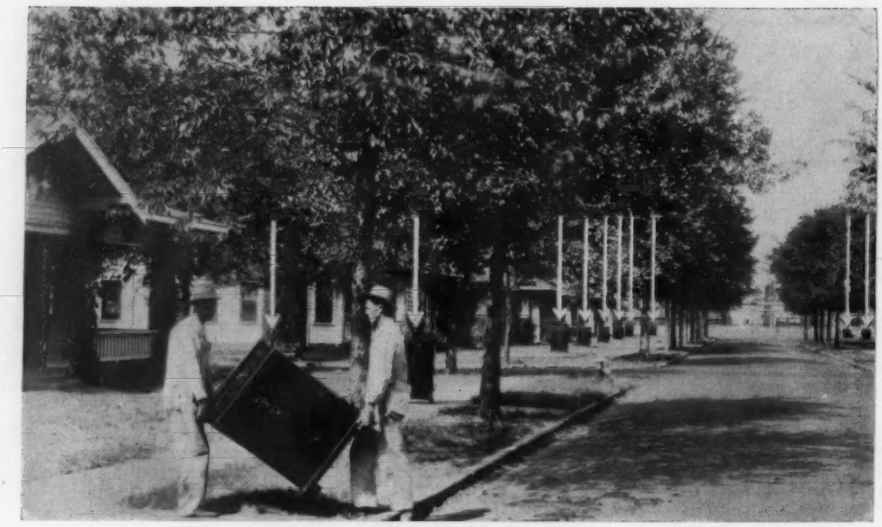
THE WILCOSTAT Automatic Room Temperature Control for gas-fired circulators maintains room temperature within 1 F. of any desired temperature between 55° and 85°. It is a simple, complete and self-contained thermostat whose four main parts are illustrated above.

It requires no electric connection or flexible gas piping. *Its operation is not affected by variations in temperature of the gas supply.* Has an unusually low pressure drop. Economical to install on new or existing heaters.

Low initial cost. No maintenance. Obtainable in ⅜″, ½″ and ¾″ pipe sizes. Prices on application.

THE WILCOLATOR COMPANY, Newark, N. J.

Specialists in Temperature Control for Household Appliances



Oklahoma Natural Gas Corp. workmen installing Moore's circulating heaters in 46 houses owned by Mid-Continent Petroleum, Tulsa, Okla.

Sold! 500 Circulating Heaters

(*Continued from Page 30*)

a great deal of difficulty was at first encountered. A very satisfactory solution of the problem of venting through ceilings and roofs was found by working with one or two reliable sheet metal concerns. A "ventilated thimble," as shown in Fig. 2, was made to our specifications; also a sheet metal flue known as a "Texas flue" (Fig. 1) which is installed through the ceiling and roof. A good installation, approved and passed by the local fire marshal, resulted. The "ventilated thimble" is used where there is no direct flue outlet and where it was necessary to go through a ceiling or wall. The thimbles cost $2.25 made up in 4-, 5- and 6-inch sizes, and were sold with the job as part of the installation at $4 each.

Where a "Texas flue" was used the territory salesman made arrangements with the customer to pay the sheet metal man direct, or if this could not be arranged the $15 charge for all sizes was put on the contract and the gas company paid the sheet metal man through the regular procedure. By using this method of proper venting we made many heater sales that otherwise would have been lost.

One of the largest refineries in the Mid-Continent field purchased 46 circulating haters for employees as shown in the photo. This order was later increased to 54.

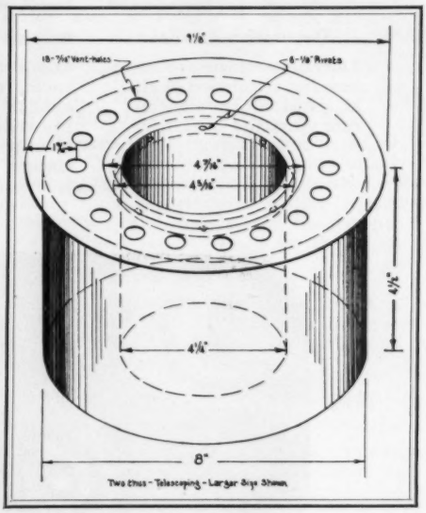


Fig. 2. Ventilated thimble.

Factors Effecting *a* Minimum Cost *in* Gas Pipe Lines

(*Continued from Page 37*)

Use of Curves

To illustrate the use of curves on Figs. XI, XII, and XIII, the tabulation in Table No. 2 shows an example of determining the diameter, probable spacing of stations, pressures, etc., to transmit 150 million cubic feet of gas a distance of 600 miles. A number of sections should be assumed to give station spacings somewhere near 85 miles. (Note Fig. X.) The quantity Q_{100} may be calculated for a 100-mile length of a line from the given quantity and length L between stations. A thin wall pipe should be taken (in this case ¼-inch) and the diameter selected must be a commercial size. The stress may be interpolated from the curves and the pressure figured or taken from Curves I and II. (When the thickness shown on the curves results in stresses too far from those desired, a thickness may be figured to give the desired stress.) The tons of steel per mile are given on the curves corresponding to the diameter and thickness. The cost of the pipe delivered is taken at $100 per ton and the laying cost as per the regular formula. From Table No. 1 the cost of one compressor station using a compression ratio of 2 is calculated to be $675,000.

See Table No. 2.

The total cost for the various station spacings do not indicate any one definite minimum. This is due to allowing a slightly different stress for the various setups in order to use a commercial pipe size and a ¼-inch wall, and to the fact that the station spacing may be varied somewhat without changing the total cost. For a stress of 15,000 pounds per square inch the selection would lie between the 75-mile and the 100-mile sections. If a stress of 15,000 pounds per square inch were used for the 85.5-mile section the 26-inch pipe would have a .273-inch wall and the 28-inch pipe a .234-inch wall, and based on the resulting weight of steel, the total cost per mile is figured for the 26-inch pipe to be $39,830 and for the 28-inch pipe $38,700. The one selected would probably be determined by conditions peculiar to the line in question, such as operating costs of the compressor stations and a consideration of the load expected.

It should be noted that for the 85.5-mile section the 26-inch diameter pipe using a stress of 16,000 pounds per square inch shows less cost per mile than the 28-inch diameter pipe with a lower stress of 14,000 pounds per square inch. It is evident that the use of a higher stress effects a saving in the cost of the line.

Stress in Wall of Pipe: All the examples in this study so far have been made using 15,000 pounds per square inch stress for steel with a minimum strength of 60,000 pounds per square inch. The curves on Figs. XI, XII and XIII, which give the diameters and corresponding tons of steel per mile for various stresses for three different wall thicknesses, show that for any given capacity the diameter and tons of steel per mile of pipe decrease materially when the allowable stress is increased. For example, referring to Fig. XI, 130 million cubic feet of gas can be carried in a 26-inch diameter ¼-inch wall pipe at 15,000 pounds per square inch stress or in a 22-inch diameter ¼-inch wall pipe at 20,000 pounds per square inch stress. The 26-inch pipe requires 181.5 tons per mile and the 22-inch pipe only 153.3 tons per mile.

The practice at the present is to use a stress of about 15,000 pounds per square inch with 60,000 pounds per square inch steel. A gas line is not subjected to shocks and rapid increase of pressure as lines carrying oil or water, or as structural members of a railroad bridge. There should be no hesitancy in using the steel at higher stresses, say with a factor of safety of 3 instead of 4. The use of higher stresses in the pipe effects a saving in the total cost more directly than any of the other factors considered in this study.

Conclusions

This study has considered all major factors affecting the total cost of gas pipe lines,

+ + SHOW YOUR CUSTOMERS HOW TO REDUCE THEIR GAS BILLS + +

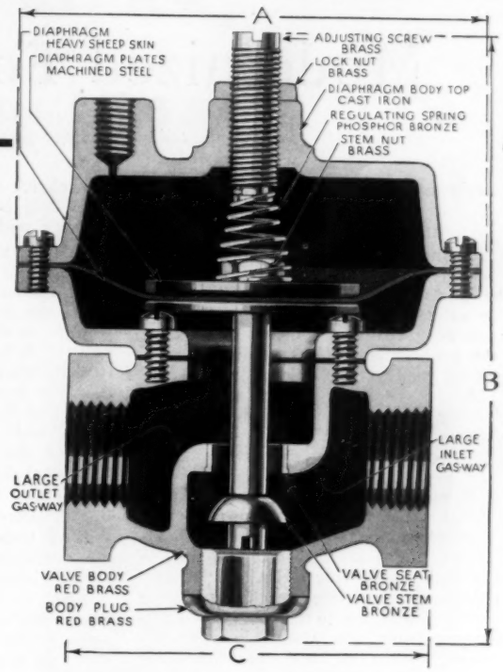
TELL your customers you have a way to save them money by reducing their gas bills—and they will listen.

Tell them how frequently it's necessary for the Gas Company to deliver GAS, the *ideal fuel*, to their meters at higher pressures than required by conversion burners, hot water heaters, or kitchen ranges, etc. Sometimes as high as 6 to 12 inches water column pressure, in order to meet peak requirements—whereas the American Gas Association recommends burning the GAS at about 3½ inches in such appliances. Therefore, they at times are wasting gas—if no pressure regulator governs the varying pressures in their house supply lines.

Tell them that often a BARBER Superior Gas Pressure Regulator, to keep the gas pressure for *all* appliances at an even and constant 3½ inches pressure will pay for itself one or more times over in a single year. And that it will continue such saving for many years, since there's nothing about it to get out of order or wear out.

This is constructive selling—and it's profitable, as many gas appliance merchandisers will tell you. For it means more than the sale of BARBER Regulators; it affords opportunities to inspect appliances and recommend replacements and new equipment. It has led to thousands of orders for BARBER Automatic Gas "Conversion" Burners and other gas appliances.

This proved business builder makes satisfied gas users. We shall be glad to cooperate with you to the fullest extent. Write for the complete sales plan, prices and attractive discounts.



Sectional view of the BARBER Regulator. Valve body is made of red brass with all brass working parts. Super-accurate—and permanent. The BARBER Superior Gas Pressure Regulator is a precision device in every respect—at a price so moderate as to make its sale easy.

TEST OFFER

We will gladly send to Gas Companies and Appliance Manufacturers, sample Barber Regulators, upon Memo Invoice, for Test purposes. Simply advise the sizes desired.

BARBER Superior Gas Pressure BURNERS

THE BARBER GAS BURNER CO.

3702-3704 Superior Avenue
Cleveland, Ohio

using cost figures that are sufficiently accurate for comparative purposes. And it brings out the fact that in order to economically design large capacity gas pipe lines, thin wall large diameter pipes should be demanded.

To effect a minimum cost of gas pipe lines, the two important factors are:

1. The use of pipe with the largest possible diameter to carry a given quantity, being limited only by a practical wall thickness.

2. The use of pipe designed with a factor of safety of 3 or even less.

Modernized Forging

(*Continued from Page 38*)

ing entirely upon radiation for heat transfers.

HEAT CONTROL

The forging furnace has three separate zones, namely preheating, heating and soaking, the parts eventually acquiring a temperature of 2300° F. The heat and soak zones are provided with burner equipment, while the preheat chamber is provided as a means of increasing the efficiency of the furnace. This is accomplished by locating the flues directly back of the inlet door, which causes the hot products of combustion to pass through this chamber to escape from the furnace. In so doing, a large portion of the heat, that would otherwise be lost, is absorbed by the cold incoming work, with the result that when the work reaches the heating chamber it has already attained an appreciably high temperature. From this point it is pushed directly into the heating zone and there brought up to the full predetermined temperature. It is then held at this temperature, in the soaking zone, in order to insure a complete equalization of heat throughout the cross section of the material being heated.

Automatic temperature controls, with motor operated control valves, maintain the correct heat in each zone, which is charted on continuous recorders. Production is based on an hourly output of 5,715 pounds. This allows a heating cycle of two hours for each piece. Cast iron plates are incorporated at each end of the furnace and the rear wall is supported on water cooled castings to permit end discharge. Two cast iron raising type doors are provided, one at the inlet end and one for the underfired combustion chamber, while a swinging door is located in the discharge chute. These are lined with 4½ inches of firebrick and 2½ inches of insulation.

On tile pillars, built up from the foundation, are laid four double, extra heavy pipes on which the work rests as it passes through. Cold water is circulated through these pipes and in addition there are two cast steel water cooled guide rails to prevent the billets from buckling during heating up. At the exit end of the furnace the hearth slopes down onto an unloading platform. The hot billets are pushed along the hearth until they strike the slope, when they roll down, opening the swinging door by their weight, the door closing automatically behind them. The billets are handled from this table with the porter bar. The skid rail pipes extend along the hearth and down the slope.

NORMALIZING FURNACE

The normalizing furnace is also continuous and automatic and of the same general type of construction as the one just described. The internal dimensions of this furnace are 4 feet from wall to wall by 18 feet long, with a height of 17 inches from the top of the firebrick hearth to the spring line of the arch. The walls and roof consist of 9 inches of firebrick and 9 inches of insulation, and the whole is encased in a steel jacket held together with double channel buckstays.

This furnace is divided into preheating heating, and soaking zones. The correct temperatures and heat gradient throughout these zones are maintained by two recording controllers with couples and motor operated valves. A 4-foot loading table, fabricated of steel members, is located at the charging end. An alloy hearth extends through the furnace. A cooling chamber, which is 10 feet long and 3 feet wide, is attached directly to the rear end of the furnace and is supported by structural steel members.

The first 3 feet of the hearth of this cooling chamber consists of alloy plates, covered with 2 inches of insulating material, while the remaining 7 feet is of steel plates. The entire hearth has four longitudinal V-notches in it, and the forgings, resting in these notches, are pushed through the furnace by means of a pneumatic pusher located at the entrance. Cast iron plates are incorporated in both ends of the furnace, the one at the rear supporting a cast iron flap type door, suitably counterbalanced. The inlet door, also of cast iron, is of the lift type and counterbalanced for hand operation. This door is lined with 4½ inches of firebrick and 2½ inches of insulation.

Over and under firing is employed, using the low pressure system of firing, and the burners are connected to inspirator sets which provide the correct gas-air ratio for perfect combustion and at the same time insure a slightly reducing atmosphere within the furnace to reduce scaling to a minimum.

Fundamentals *of* Utility Merchandising Problem

(*Continued from Page 23*)

The unfortunate side of the question is that the appliance sales of the utilities are erroneously looked upon as merchandise sales that might otherwise have been made by the trade or local merchant. The agitators ignore the fact that the larger part of the effort and expense of the utilities is directed to extending the market for appliances into fields in which the plumber or dealer could not possibly afford to pioneer.

I will discuss that question later. I have referred to it this time merely as an evidence of the fact that much remains to be done to present the correct picture to the public.

You are probably familiar with the law enacted in Wisconsin in 1929, which completely divorces appliance sales from gas or electric operations. Under date of August 9, 1930, the Railroad Commission of Wisconsin issued an order, pursuant to that law, which sweeps aside every contention of the companies as to the promotional character of expenses involved, and as to their right to sell appliances as a part of promotion. It requires that every conceivable item which may be related in any way to the sale of appliances, directly or indirectly, be classified to a non-operating account. The order goes so far as to prescribe that there shall be excluded from operating expenses such indirect items as "a proper proportion of general and miscellaneous expenses," "taxes assignable to stocks of merchandise carried or to space occupied for merchandising work" and "depreciation on buildings, equipment," etc., to the extent that such property is assignable to merchandise operations.

I do not know what course the companies in Wisconsin will follow in the matter. Presumably the logical solution is the incorporation of separate sales companies. It places upon the utilities of the State, however, a difficult responsibility to make intelligent and accurate division between promotion and merchandising expenses, and makes particularly urgent uniform treatment of expenses which are in part merchandising and in part new business.

We read also of efforts by the trade organizations to bring about similar action in other States. I believe I have pictured enough of the present conditions to give evidence of the educational problem which the utilities face, to bring about a better understanding of the underlying principles of utility merchandising, and to drive home the advantages accruing to all concerned, from the promotional efforts in question.

Fundamental Principles

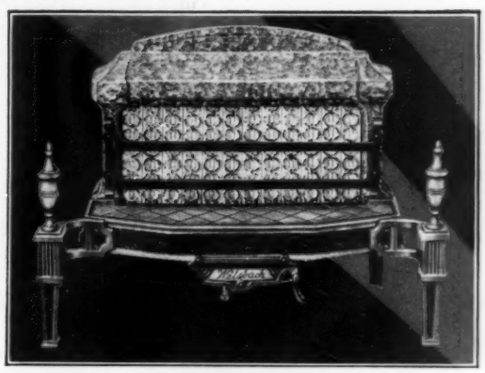
Now what are the true fundamentals of appliance sales by the industry?

The first basic fact, which is familiar to all of you, is that the companies are merchandising but one major product—gas service. They are not merchandising appliances in the ordinary commercial sense of that term. Instead, appliance sales represent but one item in the program of gas promotion, which is directed toward increased use of gas through existing appliances, as well as through the introduction of new appliances. General advertising, special displays, home service activities, together with appliance sales and other related operations, are all intergral parts of one effort.

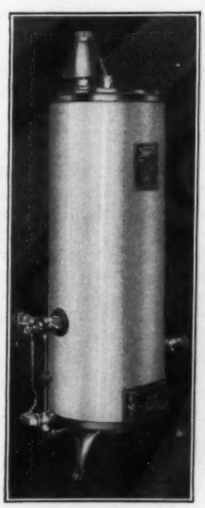
The second basic point I wish to stress is that the utilities are not selling the same appliances which they would be offering if they were only marketing commodities, as does the local merchant. The mere marketability alone does not determine the selection of appliances they offer for sale. It is necessary that they carry a complete line which will include every service that gas is economically entitled to render. That includes not only appliances which a dealer could handle profitably, but also types requiring pioneering work into fields where the educational effort or engineering service would make the sales cost prohibitive, except for the compensating benefit to the gas load.

As evidence of this fact, may I refer to the experience of my own company. During the first nine months of 1930, our appliance sales within the City of New York amounted in round figures to $5,000,000. Of that total, approximately $1,500,000 represented domestic appliance sales. In other words, the appliances coming within the category of merchandisable commodities represented less than a third of the total. I firmly believe that if that $5,000,000 of sales had been left to outside agencies, at least one-half would

Time proved value is of Key Importance in these days of Careful Buying



THESE are days of careful buying. Close scrutiny of value is the rule . . . And the name Welsbach, backed by 40 years of earned leadership in the gas appliance field, is recognized by Commercial Managers more fully than ever before as a definite factor in making sales...**Welsbach Radiant Heaters** are outstanding because of their original design and fine finish—yet are moderately priced . . . Welsbach quality is revealed in every detail of their construction.



Welsbach Water Heaters have gained their leadership through their efficient performance (and favorable prices). In fact there is not a single detail of any Welsbach appliance that will not bear close examination by today's buyers. When Welsbach gas appliances are featured, profitable sales are sure to result.

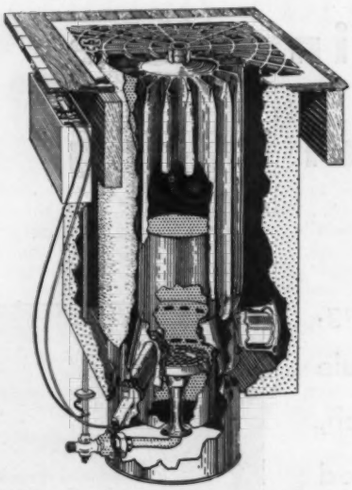
Member of American Gas Association

WELSBACH COMPANY

GLOUCESTER CITY, N. J.

Offices in Principal Cities

Electrogas
"It's Matchless"
Floor Furnace



Positive Electric Ignition
Efficient Heating Element
New Natural Gas Burner
Safety Vent Outlet
Insulated Inside Jacket
Open Base Construction

20,000 to 46,500 B.t.u. Ratings
American Gas Association Approval

Now Made in Five Sizes to Meet All Requirements

Proven Economy and Durability for Over Ten Years of Service

Attractive Agency Territory Open. Write for Details.

Electrogas Furnace Co.

Rialto Building San Francisco

Quality
since 1857
Follow the Moore Line to PROFITS.

MOORE BROTHERS CO.
Originators of the Circulating Heater
Joliet, Illinois Since 1857

have been lost to gas, in the competition with other fuels and with electricity.

The common error into which the trade representatives are prone to fall in this regard, is to assume that they could have done the same business, if the field had been left to them. Furthermore, we find them frequently describing expenses purely promotional in character, as elements of merchandising costs. They look upon promotion as a part of merchandising, instead of merchandising as a part of promotion.

That is particularly apparent in a recent newspaper comment which has come to my attention. It is entitled "A Gift to the Gas Company" and goes on to characterize *promotion expenses* as *merchandising losses,* under the caption of "Each consumer must pay about $1.10 a year of the loss on sales of appliances." It is evident that the author of the article had no idea that the "three gas engineers working on industrial sales," or the "advisory cooking expert" (to whom he refers) would be equally necessary, even if the company itself sold no appliances. Also in reference to the further title of "The Manager here admits the Department has an annual deficit of about $100,000," I am tempted to comment that the company missed an opportunity in not spiking the misuse of the word "deficit." There is no more ground to apply the term "deficit" to new business expense than to production expense or distribution expense.

A third point in this discussion of principles is the fundamental difference between utility merchandising and that of the trade, in the yardstick of successful accomplishment. For the utility, much more is involved in that measurement than the income statement of appliance operations. A broader measure is necessary. The story is not complete without the load building benefit to record the credit side of the operation.

Load building results should be the starting point of all promotional expenditures, and no doubt are in an approximate way. Due to the difficulties of accurate estimates, and uncertainty of the results (for the anticipated future consumption of any appliance is at best a guess), the companies compiling this data have been hesitant about permitting public use of the figures, or even inter-company comparisons on any general scale.

It is scarcely necessary to stress the importance of load building statistics. I do take occasion, however, to urge the development of such statistics by all companies, and the free interchange of results between companies, until there shall emerge an established practice in the industry, to place an approximate index of load building value upon each type of appliance.

The reality of load building, as the dominating influence upon appliance operations, needs to be driven home to the public. The industry has not yet successfully dispelled the lurking suspicion that load building is merely a subterfuge to cover merchandising losses. It needs to be set up in actual figures in such form that the public may be able to understand it and grasp its true significance.

Another fundamental of appliance sales to thrive, their promotional expenses must is that the utilities are amenable to the same economic laws as other business. If they are earn a return exactly as in any other business. The portion of that return which may be assigned to merchandise sales or to new business activities is relatively unimportant, and is largely a matter of bookkeeping practices, the two combined, however, must produce sufficient benefit to the gas business to make the expenditures ultimately a resultant economy in the cost of gas.

Also in this discussion of fundamentals, may I comment that the gas companies must continue in the appliance business as a matter of economic necessity for their self-preservation.

As was so ably stated by President Paige of the American Gas Association, in his address on "Sales Allies" at Atlantic City, the gas companies entered the appliance business not from choice, but from necessity for their survival, and must continue in it for the same reason. As he put it, "dealers may fill an existing demand, but the companies must create it."

Our experience with the development of gas refrigeration in New York is a striking example of that fact. I estimate that the sale of refrigerators by our System Companies during the year 1930 alone, will add more than $500,000 of revenue from gas sales in 1931.

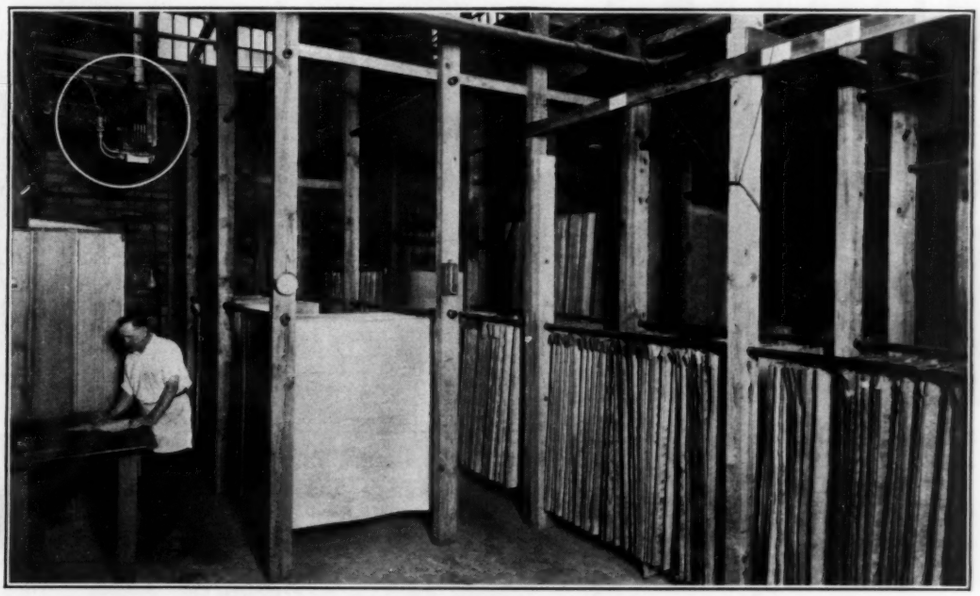
If that business had been left to outside agencies, it would probably never have become established. Certainly it could not have developed to its present proportions. The bulk of it would have been lost to electric refrigeration.

I believe that the gas companies will always be called upon to take a position of leadership in appliance sales. Too much is at stake, in competition with other fuels, and in maintaining proper standards of efficiency and safety, to permit the companies to relinquish that leadership, even if they so desired.

On the other hand, the utilities do not desire, I believe, to interfere with the sale of appliances by other agencies. There seems to be everything to gain, and nothing to lose, through the coordination of all sales effort to the common good, in a policy aptly described by Mr. Paige as "live and let live."

There is need of a definite broad policy, which will have the solid support of the industry itself, protecting the inherent promo-

Protecting 5,000 Plates against Costly Corrosion

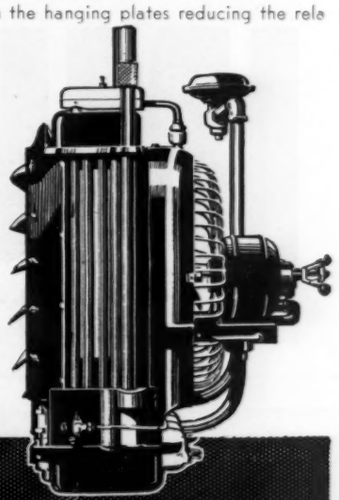


AT THE Reynolds & Reynolds printing plant, Dayton, Ohio, the problem of keeping 5,000 expensive zinc plates free from corrosion due to dampness while in the storage room, was effectively solved with Humphrey Gas Unit Heaters. Heated air is circulated between the hanging plates reducing the relative humidity of the atmosphere to a point where corrosion and consequent loss are safely avoided.

While this is only one of the many special applications of Humphrey Gas Unit Heaters, hundreds of factories and varied industries depend upon these modern gas fired heaters as their sole heating equipment. They burn gas, the ideal fuel, in the most efficient manner and the circulation of air set up by a Humphrey Gas Unit Heater gives a greater heating efficiency than other methods. They are thermostatically controlled and no operating attention is necessary.

Why not get all the facts regarding these profitable heaters?

Interesting catalog sent on request.



GENERAL GAS LIGHT COMPANY, KALAMAZOO, MICHIGAN

C. B. Babcock Co., Pac. Coast Mgr., 135 Bluxome St., San Francisco, Calif.

The Humphrey Gas UNIT HEATER

SOUTH CHESTER STEEL PIPE

Excels for Gas Service

The unusual care given to accuracy of diameter and welding qualities, makes Chester Pipe a favorite for gas lines.

SOUTH CHESTER TUBE CO.
Chester, Pa.

THE BABY DIGGER

The Ideal Modern Way To Dig Gas Trench!

Cleveland Baby Diggers are unequalled for downright usability and trenching satisfaction. Compact — transportable — economical. Tough — fast — dependable. Precision built of finest materials. A wheel type trencher on full crawlers. You'll find Cleveland Trencher pioneering the features that count. Write for particulars.

THE CLEVELAND TRENCHER COMPANY
"Pioneers of the Small Trencher"
20100 St. Clair Ave.
Cleveland, Ohio, U. S. A.
Distributed By
Edward R. Bacon Co., San Francisco, Cal.
Frank T. Hickey Co., Los Angeles, Cal.

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GAS BURNERS
For
ALL INDUSTRIAL PURPOSES

JOHN ZINK CO.
Oklahoma Natural Gas Bldg.
Phone 4-9838
TULSA, OKLAHOMA

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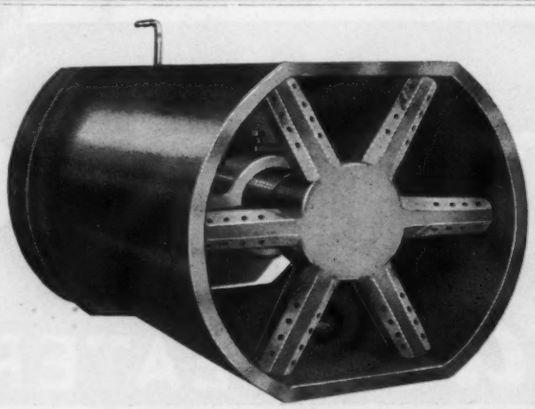
Flameless Burners
Flame Burners
Short Flame Burners



tional rights of the companies, and at the same time deserving of the confidence of the public as to the propriety of the practices involved.

The road to clear thinking on this question will require vision and the will to reach common ground. There is no place in the picture for the isolated self-satisfied attitude, that merchandising policies are purely local questions, which can be settled without regard to the interests of others. The industry will stand or fall as a whole upon the soundness of its merchandising policies, and will pay heavily for pig-headedness on the part of the few who may not support the majority findings.

It is gratifying to learn that the A.G.A. is to give study to this subject through a General Committee.

There is, however, a more tangible form in which we, as sales executives and accounting officers can contribute our bit on this question. We can determine the facts as to these operations in our own companies. We can go further, and compare our results with others, until we ascertain the conditions that are representative of the industry.

This has been the objective of the Joint Committee on Merchandise Accounting. Organized for the purpose of developing adequate merchandising records, it faced first the necessity of establishing the relationship of this operation to the gas business. In its recent report, it has recommended a classification of accounts for appliance sales, and has related them to gas promotion in a suggested statement form made a part of the report, in which the results of merchandising are combined with new business expenses.

In my own company we adopted the Committee recommendations practically verbatim, and have had them in effect for several months. We have found them to work out very satisfactorily. At present we are subdividing appliance sales, as to all direct items, into six subdivisions, consisting of domestic, hotel and restaurant, industrial, house heating and water heating, refrigeration, and miscellaneous, the latter including lighting fixtures and kitchen conveniences. It is my ideal that some day, when we have the tabulating card form of consumers accounting. we may have 50 or 100 different subdivisions, and may make direct comparison between the amount of appliance sales and the volume of gas sales in each class of business served.

The practical problem in any financial summary of appliance sales, is to determine how much of expenses common both to merchandising and to promotion, should be assigned to each. What part of such items as management salaries, rent, advertising, and salesmen's compensation, apply to each activity? The line of division is not easy, and we need the benefit of interchange of ideas to do a good job.

In our study of this question, we have endeavored to determine how much more we are spending for these items under present conditions, than we would have spent if we sold no merchandise ourselves, and have assigned to merchandising that excess. It is surprising what a large percentage of some items would be necessary for promotion alone, even if the actual sales were turned over to an outside agency.

One of our affiliated electric companies for a long time sold no appliances itself, and it may be of interest to you to know that their cost of promotion has been substantially less, since they have been selling appliances. So merchandising does not necessarily result in increased new business expenses.

To give you some definite idea of our actual division between merchandising and

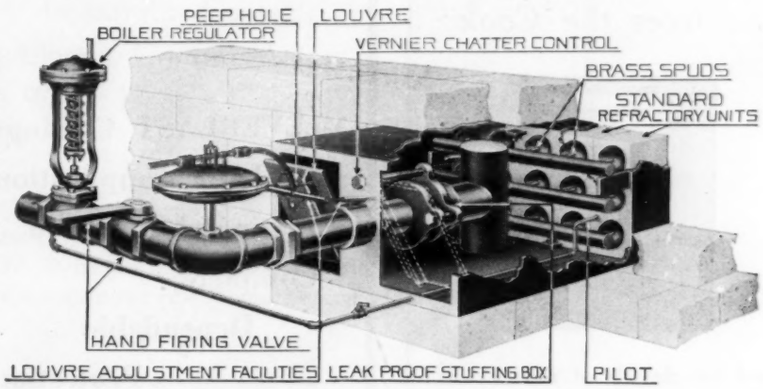
Dallas Has Learned the Truth About Gas Burners

Downtown section of Dallas showing percentage of large buildings using King Burners.

1. Hotel Mayfair
2. Cotton Exchange Building
3. Burt Building
4. Federal Building and Post-office
5. Medical Arts Building
6. Allen Building
7. Wilson Building
8. Praetorian Building
9. Dallas National Bank Bldg.
10. Insurance Building
11. Baker Hotel
12. Construction Industries Building
13. Thomas Building
14. Waldorf Hotel
15. Marvin Building
16. Republic Bank Building
17. Southland Hotel
18. Higginbotham-Bailey-Logan
19. Jefferson Hotel

Industries not shown.

King Synchronized Control of varied and variable combustion factors eliminates service expense. . . . Troubles arising from fluttering—vibration—improper air mixture . . . varying gas pressure and B.T.U. content—stack and draft variations—wind deflection, etc., positively tuned out with radio-like selectivity. . . . Simple in control and adjustment.



Write for Pamphlet—"Gas Combustion"

KING BURNER COMPANY Inc.

BURT BUILDING – DALLAS, TEXAS

LIVE ON TOP OF THE WORLD...IN NEW YORK

Stop at New York's largest and tallest hotel . . . 2500 rooms . . . 43 stories high . . . every room has radio; both tub and shower; Servidor; circulating ice-water; full-length mirror; bed-head reading lamps. Four popular restaurants. Tunnel connection to Pennsylvania Station.

THE NEW YORKER

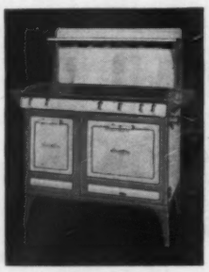
34th STREET AT 8th AVENUE, NEW YORK

RALPH HITZ : MANAGING DIRECTOR

Smoothtop

GAS RANGE

"Captures the flavor . . . frees the Cook"



Send for details of new Profit Building Special Christmas Campaigns.

Standard Gas Equipment Corporation

18 East 41st Street, New York

Pacific Coast Distributor: Northwest Gas & Electric Equip. Co., Portland, San Francisco, Los Angeles

DEPENDABLE PROTECTION for Pipe Lines

McEVERLAST Coatings
+Mechanical application
+Engineering service
=Complete,
Dependable
Protection

McEVERLAST, Inc.

111 West 7th St. Russ Building
LOS ANGELES SAN FRANCISCO

promotion, we assign to merchandising one-half of management salaries in the domestic division and the hotel and restaurant division, based upon the estimate that one-half of our present staff would be required even if we sold no appliances ourselves. In the industrial and house heating divisions, however, we would require the same staff for promotion alone. There we distribute the management costs to each operation, in the same ratio per dollar of sales, rounding the figures to 10 per cent merchandising and 90 per cent to new business.

Commisisons paid to salesmen are classified to merchandising, and the base salaries and load building bonuses to new business.

Our advertising has all been primarily designed to stimulate the use of gas, and the appliances which may have been shown were merely incidental to that end. After much discussion, we have adopted the same distribution of 10 per cent merchandising and 90 per cent new business, on the theory that although our advertising would be as much or more if we sold no appliances, merchandise sales also reap a benefit from the expenditure.

It is possible only to touch upon a few high spots as to the application of the classication. We are making this merchandising study for statistical purposes only. In our general books, we classify the total of these items to the prescribed new business expense accounts.

The Joint Committee has thus far only provided a standard yardstick for the measurement of merchandising and new business activities. There remains the task of applying it, both as to financial and load building results, and of reaching composite totals which will be representative of the industry.

CALIFORNIA ADDS 600 MILES OF LINE DURING FISCAL PERIOD

IN an annual report submitted to Governor Young, the California State Railroad Commission gave the following report of gas transmission line construction during the past fiscal year, together with production figures.

In that period the gas utilities of California have laid more than 600 miles of natural gas transmission lines at a total cost of approximately $30,000,000. These transmission lines have a total carrying capacity of approximately 400,000,000 cubic feet of gas per day.

The total production of natural gas in California during the fiscal year was 599,432,424,000 cubic feet. The disposition of this gas was as follows: Sold to gas utilities, 128,176,999,000 cubic feet, or 21.4 per cent; used as refining fuel, 18,554,883,000 cubic feet, or 3.1 per cent; used as fuel in the oil fields, 77,006,793,000 cubic feet, or 12.8 per cent; used for gasoline plant fuel, and shrinkage, 80,478,702,000 cubic feet, or 13.4 per cent; used for repressuring oil fields and storage, 15,428,477,000 cubic feet, or 2.6 per cent; and blown into the air and lost 279,786,570,000 cubic feet, or 46.7 per cent.

During the fiscal year there was sold to some 1,310,880 gas consumers in California a total of 94,991,776,000 cubic feet of natural gas and 19,899,805,000 cubic feet of manufactured gas.

C. L. BROCHSCHMIDT NOW WITH COUNCIL BLUFFS GAS CO.

C. L. Brochschmidt, industrial engineer for the Lone Star Gas Corp., Dallas, Texas, has been transferred to the Council Bluffs Gas Co., Council Bluffs, Iowa, to handle industrial installations.

TIME-O-STAT

OFFERS YOU A COMPLETE LINE *of* AUTOMATIC CONTROLS *for* GAS-FIRED EQUIPMENT

•

Room Thermostats
Electric Gas Valves
Plain Diaphragm Gas Valves
Electric Diaphragm Gas Valves
Electric Limiting Devices
Gas Type Limiting Devices
Storage Heater Safety Pilots
Safety Pilots for Furnaces and Boilers
Gas Type Throttling Thermostats for Ovens
Individual Room Heater Controls
Combination Low-Water and Pressure Controls
Incinerator Controls
Electric Control Motors
Water Heater Controls

•

We will appreciate the opportunity of working with you toward the solution of your control problems for 1931. Write for literature or we will be glad to have representative call at your request.

•

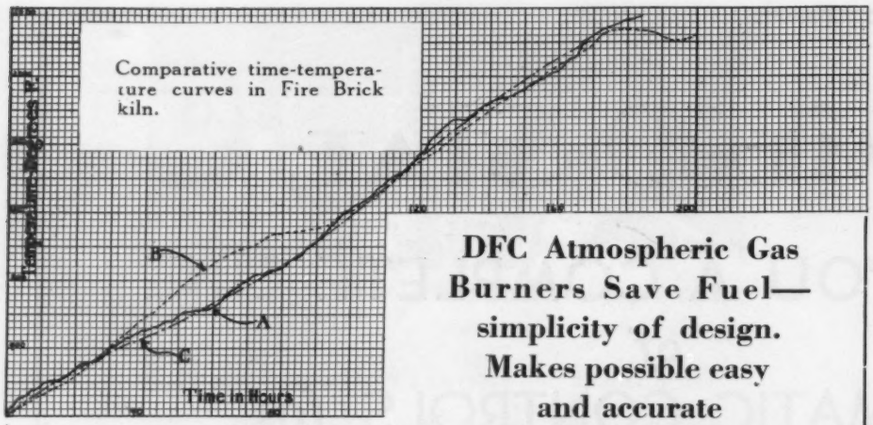
BRANCH OFFICES
NEW YORK
BOSTON
CHICAGO
EXPORT DEPARTMENT
NEW YORK

TIME-O-STAT CONTROLS COMPANY
ELKHART, INDIANA

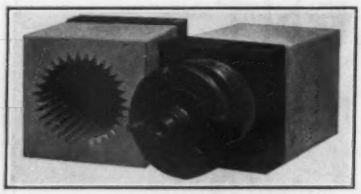
EXCLUSIVE DISTRIBUTORS
IN ALL PRINCIPAL CITIES
OF THE UNITED STATES

CANADIAN DISTRIBUTORS
TORONTO AND MONTREAL

Manufacturers of Automatic Controls for Oil Burners, Gas Burners, Coal Burners, Electrical Refrigerators, Furnace Fans, Mechanical Stokers, Industrial Ovens, Ice Machines, Unit Heaters . . . also of Sign Flashers, Mercury Switches, Electric Heaters, Corrugated Metal Bellows



DFC Atmospheric Gas Burners Save Fuel—simplicity of design. Makes possible easy and accurate temperature control.



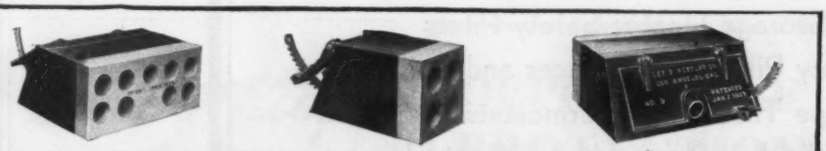
Curve "A" shows how closely natural gas, burned through a DFC Atmospheric Gas Burner, followed the ideal temperature curve "C". Oil performance is shown by curve "B". For 1000 9" equivalent, gas required only 17,213,840 b.t.u., while oil required 17,775,000—a saving of more than 3.2% in favor of natural gas. Following the ideal temperature curve closely, gas required only 184 hours to reach 2,350° F. Oil required 210 hours to reach 2,250° F.

Write for Bulletin 350

THE DENVER FIRE CLAY COMPANY

DENVER DFC COLO. U.S.A.

BRANCHES AT SALT LAKE CITY, EL PASO, AND NEW YORK



Mettler Entrained Combustion Gas Burners FOR ALL Purposes Kinds of gas Pressures

406 S. Main St. LEE B. METTLER, CO. Los Angeles Cal.

Gentlemen:
Kindly send me a sample can and full details regarding A-B Vit

The New Porcelain Enamel Cleaner

Name.....

Company.....

Address.....

No obligation, of course
Clip and mail today to

A-B STOVE CO., Battle Creek, Mich.

WILLIAMS RADIATOR CO. OFFERS NEW GAS STEAM UNIT

Williams Radiator Company, Los Angeles, is offering to the industry a new gas steam radiator, manufactured by the company in its Los Angeles plant. It is made in more than 20 sizes, from the No. 26, 27 inches high and 10 inches in length, weighing 80 pounds, to the No. 180, 32 inches high, 47½ inches long, and weighing 495 pounds. The model here illustrated is 32 inches high, and is equipped with a thermostat and a new feature—the Bunsen automatic pilot lighter which does away with the use of matches.

In the Williams positive gas control, the action of the diaphragm against its seat prevents further passage of gas at that point and limits the flow thereafter to that flowing through the by-pass.

The size of the venturi tube varies to conform with the size of the burner, it being a principle of the manufacturer's design that the tube for air mixture will function more efficiently when it is proportioned in diameter and length to the volume of gas and air which it is intended to pass. The entrance end of the venturi tube is provided with an air shutter which is locked in its proper position for correct combustion.

OIL AND GAS ASSOCIATIONS IN JOINT CONVENTIONS

The Montana Chapter of the Rocky Mountain Oil & Gas Association will hold its Sixth Annual Convention at the Rainbow Hotel, Great Falls, Mont., December 12 and 13. The convention will be held jointly with the Oil and Gas Association of Alberta in line with a custom instituted last year by a meeting held by the two orginzations at Calgary, Alberta.

Business sessions will be held morning and afternoon of both days, and will include a meeting of the state committees of Wyoming and Montana of the National Code of Marketing Practices. Evening entertainment features will include a program by the Mystic Order of Wildcats, and the annual cabaret dinner and dance.

WISCONSIN SOUTHERN GAS CO. OPENS HASTINGS, MINN., PLANT

Wisconsin Southern Gas Co., recently opened a butane gas plant in Hastings, Minn. This organization has 19 plants operating throughout Wisconsin and has 59 franchises for the distribution of gas.

STATE FUEL SUPPLY TO SERVE NATURAL GAS IN VERDEN

Verden, Okla., will receive natural gas through the mains of the State Fuel Supply Co., headquartered at Oklahoma City.

No fires to bother with during cold days...
—that's the convenience of heating with Gas!
HEAT—without bother or thought
Clean, care-free heating with Natural Gas
...it costs less to use
Natural Gas... a safe fuel for heating your home
—supplies clean, healthful warmth at a finger's touch!
Natural Gas costs less to use
Smile at your heating job this winter
Natural Gas costs less to use
It gives clean and safe automatic heating
All the HOT water you want
—no waiting
Landlords!
keep tenants happy with heat—at a finger's touch
Avoid this sign
FOR RENT
Natural Gas
safe, cleaner, more convenient
Costs less to use
PACIFIC GAS AND ELECTRIC COMPANY
P·G·and E·

Field Work and the Cheering Section --each has its place.

A football victory is not won solely by the vocal pep of the cheering section.

The same principle applies to putting over a good score in the sale of gas heating equipment; for, after all, it's *field work* that counts in both cases.

This year the P. G. and E. put to work in the *field,* eighty gas heating newspaper advertisements, ranging in size from the noticeable 3 column by 10 inch ads to the dominating full page ads. These advertisements helped to increase sales for all of those who sell gas-fired heating appliances in territory served by this Company.

Reproduced above, you see but a few of this year's advertisements which appeared in more than 240 newspapers. Furthermore, practically every ad urged prospects to see modern gas heating equipment at *dealers'* stores.

So continue to display gas heating appliances—in order to attract, to your store, the prospects created by Advertising—which, by the way, hasn't cost you a single penny.

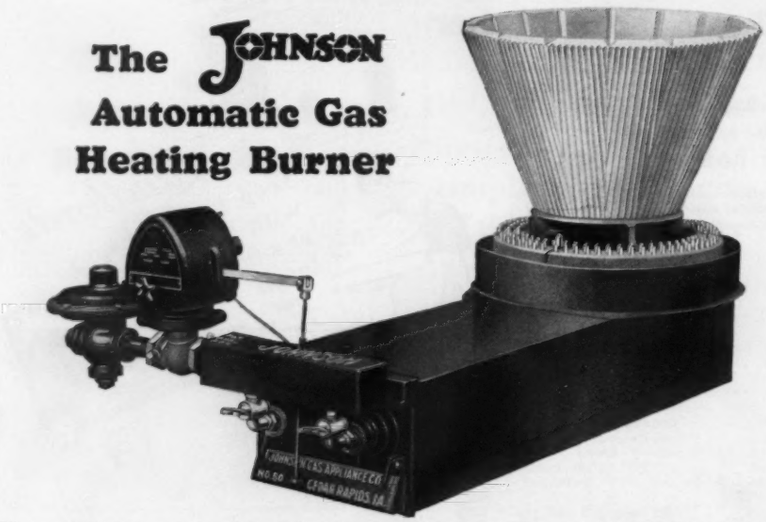
PACIFIC GAS AND ELECTRIC COMPANY

P·G·and E·

Owned · Operated · Managed
by Californians

Opening the Door to a Great Load-Building Field

The JOHNSON Automatic Gas Heating Burner



The possibilities of gas home heating as a load builder are materially increased by this unusual burner. The demands of the public for maximum safety, efficiency, and dependability are more than gratified by this carefully designed burner. We are anxious to tell you the whole story—please write.

JOHNSON GAS APPLIANCE CO.
Cedar Rapids IOWA

Pacific Coast Representative—C. B. BABCOCK CO.
135 Bluxome St., San Francisco, Calif.

GROBLE
REGULATORS & GOVERNORS

Complete Line of Regulators for

Natural, Manufactured, Butane and Propane Gas

Pacific Coast Representative,

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661 Howard Street San Francisco, Calif.
Phone Garfield 8419

GROBLE GAS REGULATOR COMPANY
Office and Factory: Anderson, Indiana

T A P P A N

Supremacy

is not a newly-won achievement, but an old and accepted standing in the eyes of gas appliance men and the public alike. No other gas range combines so many outstanding superiorities into such a perfect whole—the TAPPAN Insulated Oven gas range.

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F. W. Schwab
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Tacoma

SOUTHWEST DISTRIBUTING CO. TAKES OVER LIVE OAKS GAS CO.

W. F. Ivers, division manager of the Southwest Distributing Co., United Gas System unit at New Braunfels, has announced acquisition of the Live Oaks Gas Co., serving Pleasanton and North Pleasanton, Texas.

Extension of the service to all residents desiring it is planned by the company, and a canvass will be made of the territory. Sam Ricks, manager, will remain as representative for the Southwest Distributing Co.

Before its change in ownership, the Live Oaks Gas Co. purchased gas from the Southern Gas Co., also a United Gas System unit.

CONSUMERS GAS CO. WITHDRAWS FRANCHISE APPLICATIONS

Consumers Gas Co., a Standard Oil Company of California subsidiary, has asked the State Railroad Commission to dismiss the pending applications of the company in Atwater, Livingston, Delhi, Keyes, Ceres, Hughson, Empire, Waterford, Hickman, Salida, Ripon, Escalon, Atlanta, Ellsworth and Valley Home. These towns are all in the San Joaquin Valley. The original franchise applications asked for permission to establish liquefied natural gas plants and distribution systems.

Pacific Gas and Electric Co., San Francisco, has applied for franchises in several of these towns to serve natural gas.

W. F. IVERS NAMED DIVISION MANAGER FOR UNITED GROUP

The United Gas Corp. has named W. F. Ivers, merchandise sales manager for Dallas Power and Light Co. for the last five years, as division manager of the South Texas group of properties operated by the company. His headquarters will be in New Braunfels.

Nine years' experience in the public utility service in Texas is included in Mr. Ivers' record. He came to Texas from Schenectady, N. Y., and has been prominently identified in business and civic activities in Dallas.

EMPLOYEE CLUB ELECTS OFFICERS FOR THIRD YEAR OF WORK

The B. T. U. Club of the Lone Star Gas Co., recently began its third year of activity. Officers chosen to lead the affairs of the club for the coming year are W. R. Stephens, president; B. L. Rogers, vice-president; John L. White, treasurer, and G. B. Hillyer, secretary. The board of directors is composed of Willard G. Wiegel, retiring president; Sam Grasinger, John L. White, John Talty, and G. B. Hillyer.

HARGRAVES TO HAVE CHARGE OF DOMESTIC SALES IN EL PASO

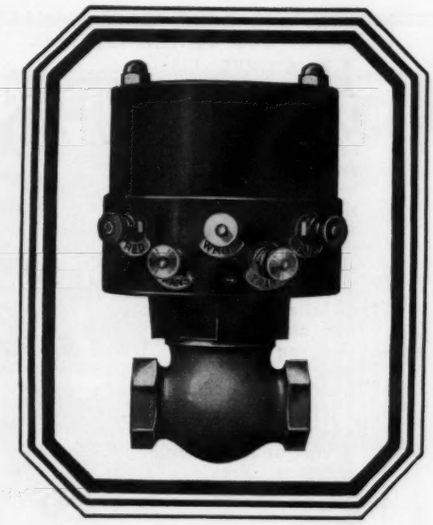
George Hargraves, formerly in charge of conversion burner sales for the Texas Cities Gas Co., at El Paso, has recently been made assistant manager of the sales department for that company, and will have charge of all domestic sales in El Paso.

BUTANE AT CLARINDA COSTS 43.8 CENTS PER M.C.F. TO MAKE

A. J. Lawler, superintendent of construction for the Central States Electric Co., reports a net manufacturing cost of 43.8c per thousand cubic feet for butane gas at the Clarinda, Iowa, plant.

AMERICAN GAS CO. ASKS FOR TWO KANSAS PERMITS

Natural gas franchises at Williamsburg and Waverly, Kans., is being asked by the American Gas Co., of Galena, Kan.



Performs better—
Costs less—

The Teeple Electric Gas Valve

The Teeple electric gas valve has been designed and built to do a better job than any valve yet developed for the industry. Not just the best valve for a certain type of installation, but the best all-around valve for the dozen and one various conditions that gas men are called upon to face in actual operation. Of first importance is the fact that the Teeple valve is motor driven—it is smooth and positive in operation. It works quietly, dependably. Operates successfully with small door bell transformer because it consumes only 3 or 4 watts (at 12 volts). Does not have to be installed near the thermostat. Has surplus power which handles any gas pressure in commercial use. . . . These and other points stamp the Teeple valve with superiority. And last, but by no means least, the Teeple valve costs less to buy; costs less to install; costs less to operate; costs less to service. Whatever your experience with valves, it is our sincere belief that you will find the Teeple valve far and away the best you have ever used. A descriptive folder will gladly be mailed on request.

L. R. TEEPLE COMPANY, 540 East 9th St., Portland, Oregon

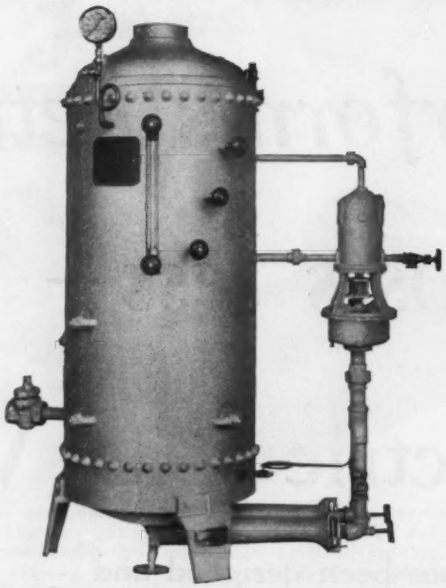
TEEPLE

TEEPLE

ELECTRIC GAS VALVE

Automatic Gas Fired Boilers

LATTNER



All Sizes from ½ to 30 H. P.

P. M. LATTNER MANUFACTURING CO.

Factory
516 12th Avenue
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ATTENTION! Commercial Members Gas Companies

A Spic and Span gas stove is a credit to the house-wife and can be kept that way by the use of

Removes Grease

DOUBLE DUTY
REG. U. S. PAT. OFF.

Prevents Rust

GAS RANGE & STOVE CLEANSER

WALMAR LABORATORY Oshkosh, Wisconsin

Western Distributor
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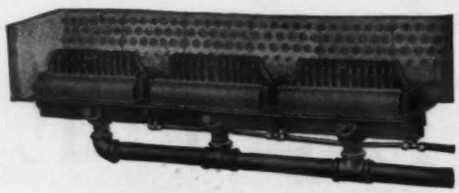
R. M. C. Gas Burner



Durable Safe Economical

ROTARY MANUFACTURING CO.

5720 Long Beach Avenue Los Angeles, California

H. S. GREENE SALES MANAGER FOR CHAIN BELT CO.

H. S. Greene

H. S. GREENE, formerly general sales manager of the Barber-Greene Co., Aurora, Ill., has been elected to a similar position as sales manager with the Chain Belt Co., of Milwaukee, Wis., manufacturer of chain, conveying and construction equipment. Mr. Greene has been with the Chain Belt Co. since 1929, in charge of the co-ordination of sales and distribution. Previous to that he had been with the Barber-Greene Co. for eight years.

STANDARDS YEARBOOK FOR 1930 READY FOR DISTRIBUTION

The 1930 Standards Yearbook, compiled by the National Bureau of Standards, United States Department of Commerce, is now off the press and ready for distribution. This is the fourth annual issue of this publication, and deals with standardization and simplification practice. Copies may be obtained from the Superintendent of Documents, Government Printing Office, Washington, D. C.; the price is 75 cents.

FT. LUPTON TO BE SERVED BY COLORADO-WYOMING LINE

Public Service Co. of Colorado, Denver, has applied for a natural gas franchise in Fort Lupton, Colo. Supply will come from the Colorado-Wyoming Gas Co.'s line from Denver to Cheyenne, the connection being made north of Lafayette. The distribution system will cost in the neighborhood of $30,000.

RONSICK LEAVES TEXAS CITIES TO ENTER INVESTMENT FIELD

E. H. Ronsick, formerly industrial engineer for the Texas Cities Gas Co., at El Paso, has recently resigned his position with that company to become state manager for the Investors Syndicate Co., with headquarters at El Paso.

ARTHUR SCHMOHL ON SALES STAFF OF COUNCIL BLUFFS GAS CO.

Arthur Schmohl has accepted a position in the sales department of the Council Bluffs Gas Co., Council Bluffs, Iowa. He was formerly representative for the Detroit-Michigan Stove Co.

MINNESOTA NORTHERN POWER BUYS MISSOULA GAS AND COKE CO.

Announcement has been made of the purchase of the Missoula Gas and Coke Co., by the Minnesota-Northern Power Co. According to R. M. Heskett, general manager of the Minnesota-Northern, natural gas will be brought to Missoula by way of Kalispell. The company operates plants in several cities of eastern and northern Montana.

NORTHWESTERN UTILITIES, LTD., BEGINS WINTER COOKING SCHOOLS

Northwestern Utilities Ltd., Edmonton, Alberta, inaugurated its home service cooking schools on October 28. Miss Katheleen Esch, home service director, will carry on these schools throughout the winter months.

Thousands of Homes are Ready

for Pacific Gas-Steam Radiators

GOOD BUSINESS awaits the dealer in any territory who sells Pacific Gas-Steam Radiators NOW. The homes of scores of your own prospects are ready right now for the healthful steam heat this quality equipment brings. It's a gift for the home that assures complete comfort in the coldest weather . . . abundant STEAM heat by simply striking a match.

Other dealers are cashing in with Pacific Gas-Steam Radiators. Easy and simple to install, last indefinitely, are trouble proof, and carry a substantial profit. Immediate delivery. Write for full details NOW.

Radiator Sections

are fine, smooth grey iron castings, accurately machined and pressed together to make radiators of permanent steam and gas-tight construction.

Outstanding Quality . . . the Fruit of 18 Years of Manufacturing Experience

Pacific Gas Radiator Co. is the oldest and largest manufacturer of gas-heating equipment in the West. Pacific Gas-Steam Radiators are only one of many outstanding developments of this pioneer organization. Materials and workmanship are of the highest grade, and every appliance is thoroughly tested under actual working conditions before it leaves the factory. Radiators are supplied in 26″ and 32″ heights, in as many sections as required.

Get Details of the Profitable Pacific Gas Agency Plan

Write today for complete descriptive literature on Pacific Gas-Steam Radiators, or other Pacific Gas Appliances shown below, together with details of the attractive Pacific Agency Plan. We'll cooperate 100% in building for you the same kind of profitable business that other Pacific Dealers are enjoying.

A. G. A. Approved

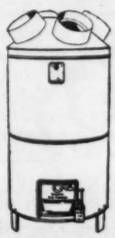
Every Pacific Gas-Steam Radiator bears the Blue Star of the American Gas Association, and is also approved by Underwriters' Laboratories.

Pacific Gas Radiator Company

Gas Heating Headquarters

Roseberry and Walter Streets
Huntington Park California

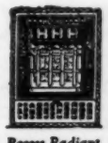
Gas-Steam Radiators



Round Furnaces

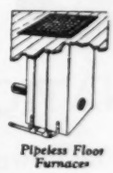
Dual Pipeless Furnaces

Fireplace Radiant Heaters



Recess Radiant Wall Heaters

Automatic Storage Hot Water Heaters



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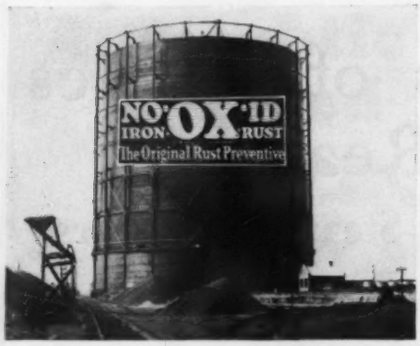
Agencies Throughout the West

Call for a Pacific Heating Engineer

MANUFACTURERS *of* EVERY TYPE *of* GAS HEATING APPLIANCE



Another Giant Holder Safe from Rust

The lifts of this 6,000,000 foot holder were coated with NO-OX-ID "A Special X" a few weeks ago.

The experience of many gas companies from coast to coast has proven the superiority of NO-OX-ID in protection regardless of climatic conditions. The ease of application, relatively low cost, duration and reliability of protection afforded have caused many companies to standardize on NO-OX-ID both for gas holders and gas lines. Investigate! Let us supply data, recommendations and estimates.

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BITURINE COATINGS

Biturine Enamel

Biturine Enamel Primer	Biturine Coupling Solution
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Specialists in the science of protective coatings for industry

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EXPORT OFFICES: Head Office—160 Freemont Street, San Francisco, Calif. U. S. A.

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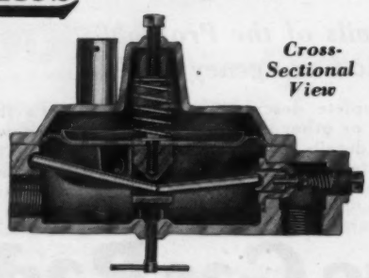
Reynolds
Gas Control Since 1892

Reynolds Little Giant Regulator

Products for all kinds of Pressure Reduction—for either artificial or natural gas.
GOVERNORS—Intermediate Pressure, Triple Outlet, Holder, Toggle Type Street.
REGULATORS—High Pressure Service, Low Pressure Service, High Pressure Line, Single and Double District Station.
VALVE—Automatic Quick Closing Anti Vacuum.


Cross-Sectional View

Reynolds Gas Regulator Company
Anderson, Indiana

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COMBINATION GAS and OIL BURNERS

For Power Plant and Industrial Uses

Write for Literature
and List of Installations

FORNEY COMBUSTION ENGINEERING CO.
305 THOMAS BLDG., DALLAS, TEXAS

Coast Counties Builds New Watsonville Office

PLANS have been completed by Coast Counties Gas and Electric Co., headquartered in Santa Cruz, Calif., for a new office building to be erected in Watsonville, Calif. The new structure will be located on the east side of Main Street just north of 50th Street, at an estimated cost of approximately $60,000.

According to present plans this will be a one- and two-story building, of Spanish design, the exterior finished in white with a red tile roof, while the entire property will be beautifully landscaped and floodlighted at night.

The lot on which the new building will be erected has a frontage of 91 feet, with a depth of 236.5 feet. The structure will be of ell shape, with a display room extending across the entire frontage, with the exception of a double driveway on the Fifth Street side. This driveway will permit cars to drive into a parking space at the rear of the building, reserved for the convenience of patrons while conducting their business in the office.

The lobby and counter for payment of bills will be located in the main part of the building, while the district manager's office will be along the driveway side, as will a large conference room for gatherings and meetings of employees.

The display room will provide for a showing of all gas and electric appliances, including both gas and electric model kitchens. The entire building will be heated by a gas fired system, which will be located in the basement of the structure.

The construction of this new office building is part of a program of development outlined for the current year, and N. E. Paulsen, manager of the company's Watsonville office, has advised that construction work will be under way very shortly and that he hopes to occupy the new headquarters by early spring.

The new office will be built under the direct supervision of Standard Management and Operating Corp., of San Francisco.

COLORADO INTERSTATE TO SERVE PORTLAND CEMENT CO.

The Portland Cement Co., at Portland, Colo., has signed a natural gas contract with the Colorado Interstate Gas Co., of Colorado Springs. Although the anticipated consumption is not given, it is believed the cement company will use approximately the same amount of natural gas used by Ideal Cement Company at Fort Collins, Colo., sister plant, which meters approximately 2,500,000 M.c.f. daily.

INLAND EMPIRE PROPERTIES TRANSFER IS AUTHORIZED

Inland Empire Gas Co., El Centro, Calif., has been authorized by the State Railroad Commission to transfer its properties in the communities of El Centro, Imperial Valley, Brawley, Heber and Calexico, to the Natural Gas Corp. of California. The latter is authorized to issue $124,500 of its common capital stock in payment therefor.

EDMONTON SYNDICATE ASKS TO SERVE IN IRMA, ALBERTA

The franchise for service of natural gas in Irma, Alberta, has been asked by the Edmonton Syndicate, Edmonton, Alberta. Source of the supply was not named, but it is believed that the line will be constructed from either the Wainright, Viking or Kinsella fields.

Are You Selling the HEALTH *and* COMFORT *of home heating the* ROBERTS WAY?

DURING the past year we have been preaching the gospel of selling health and comfort in the home—by establishing home heating departments and merchandising home heating by gas the Roberts way.

If your company has taken advantage of the great country-wide sweep in the popularity of gas as fuel—your gas revenue has increased enormously during the past six months. And you have the satisfaction of knowing that you have rendered a genuine service to every gas user in clean, healthful and economical heat.

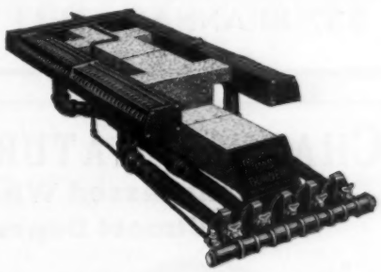
The Roberts Controlled Gas Heating Unit answers every demand for efficient home heating by gas. It measures up to every demand of service, quick response to heating needs, economy of operation, and all around general efficiency. It was designed by a man who knows the requirements of home heating by gas. It is being built and serviced by an organization of men trained in the gas industry.

Sell Health and Comfort in home heating the Roberts way. Gladly will we give any gas company the benefit of our many years of experience in working with utilities in the installation of home heating departments. Send for our complete treatise on the subject entitled, "Sell Health and Comfort." A copy is yours for the asking.

ROBERTS CONTROLLED GAS HEATING UNIT

This is an illustration of the Standard Roberts Controlled Gas Heating Unit. It has had wide acceptance among gas companies and their customers the country over.

Above is illustrated the new Roberts Junior Burner. This new product opens a vast undeveloped field for the moderate home in burning gas as fuel.



For rectangular boilers, the above Roberts Controlled Gas Heating Unit is ideal.

ROBERTS-GORDON APPLIANCE CORPORATION

DELAWARE AVENUE AT TUPPER STREET

CURTISS BUILDING BUFFALO, N. Y.

VITEX

—the perfect Gas Vent and Flue Pipe

Light Weight
Non-Corrosive
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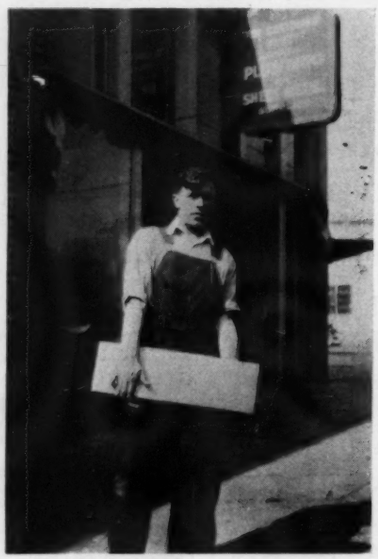

. . . and Easier and Cheaper to Install than Heavy Types of Pipe . . . . . .

For fully descriptive catalogue and prices write

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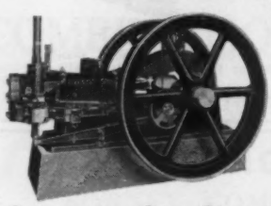
CHARTER NATURAL GAS ENGINES

Are Unsurpassed Where Economy, Long Life And Utmost Dependability Is Desired



Made in 20 to 200 H. P. Sizes—1 and 2 cylinders. Slow Speed, Horizontal, Stationery, Long Stroke.
A Thoroughly Tried Out Engine for All Purposes

Write For Full Information—Now

CHARTER GAS ENGINE COMPANY - STERLING, ILLINOIS
Manufacturers of Dependable Gas Engines Since 1880

Army Large User *of* Gas *in* Colo.-Wyoming District

THE U. S. Army has "gone gas" in the Colorado-Wyoming district. Fitzsimons General Hospital, Denver, is installing complete natural gas equipment for cooking, water heating and house heating purposes on the reservation just east of Denver.

Fort Logan, 10 miles southwest of Denver, has hooked onto the Colorado-Wyoming Gas Company's natural gas line, which carries Amarillo gas to northern Colorado, and more than a mile of services to the 25 officers' quarters has been installed, supplying gas for cooking and water heating purposes.

Fort Francis E. Warren, near Cheyenne, Wyo., also supplied by the Colorado-Wyoming company, has been connected with the Amarillo supply by means of a three-mile pipe line extending from Cheyenne, Wyo., to the fort. Cheyenne Light, Fuel & Power Company retails the gas. Soldiers from the garrison furnished labor incidental to placing services within government boundaries.

Public Service Company of Colorado, Denver, delivers the natural gas at Fitzsimons, and anticipates an annual consumption of about 650,000,000 cubic feet. This is one of the nation's most notable hospital jobs from a standpoint of natural gas usage. The contract was signed by C. W. Gale, Public Service Company's industrial gas superintendent, early in 1929, but final papers from the war department in Washington did not reach Denver until August, 1930. Work of converting the present 2,400 horsepower coal-fuelled boilers to gas was completed in November.

Under the natural gas set-up steam from the central power plant will service some 160 major buildings, including kitchens, laundry, ice plant and patients' quarters, as well as messes. The Colorado Interstate Gas Co. laid a 2½-mile pipe line to connect the reservation with its main conduit on Denver's southern border.

MEMPHIS NATURAL BEGINS SERVICE ON NEW MISSISSIPPI LINE

Natural gas was turned into the new pipe line extending from Greenville to Greenwood, Miss., early in November, according to statement of D. C. Shaffer, general manager of Memphis Natural Gas Co. The announcement was made through Appalachian Gas Corp., which owns about 46 per cent of the common stock of Memphis Natural.

Work on the new line, through which Memphis Natural Gas Co. expects to market approximately one billion cubic feet of natural gas annually, was started Aug. 20. Tapping the company's main 18-inch pipe line, which extends from the Monroe field of Louisiana to Memphis, Tenn., 210 miles away, the new lateral will supply gas to the towns of Leland, Indianola, Morehead, Ittabens, Greenwood and North Greenwood, Miss.

REGINA COUNCIL RECOMMENDS TRI-CITY UTILITIES FRANCHISE

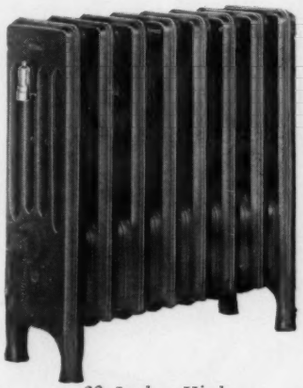
The city council of Regina, Saskatchewan, has decided to award a 20-year gas franchise for the city to Tri-City Utilities, Ltd., which is the new name adopted by the Moore interests. The decision of the city council will have to be ratified by general ballot.

WEST SIDE NATURAL GAS COMPANY WANTS COALINGA PLANT

West Side Natural Gas Co., Taft, Calif., has applied for permission to purchase the gas plant, municipally owned, in Coalinga, Calif.

New features of the
Williams Gas Steam Radiator

(Patents applied for)



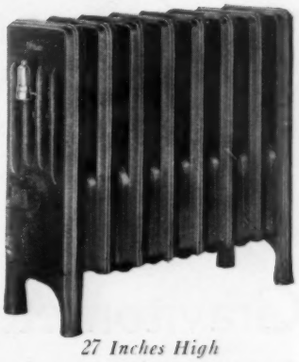
32 Inches High

More efficient — More compact
Better looking.

IMMEDIATE HEAT. (no waiting as heretofore)

AUTOMATIC LIGHTER. (no matches required)

COMPACT. Unsightly mechanical equipment at ends of radiator is eliminated. Less floor space required.



27 Inches High

A Size for Every Requirement

Sectional view showing burner, water chamber and loops containing steam.

Williams Gas Steam Radiators are made in 22 sizes, ranging from 26 square feet to 180 square feet of rating. Complete information, including **delivered** prices, will be sent on request.

POSITIVE GAS CONTROL. When steam pressure is developed in a Gas Steam Radiator the action of the diaphragm against its seat is intended to prevent the further passage of gas at that point and to limit the gas flow thereafter to the amount of gas that passes through the by-pass. In many instances, however, the diaphragm **does not seat tightly** and gas continues to flow through the leak at that point. This is corrected in the Williams Gas Steam Radiator by its positive gas control illustrated in Fig. A.

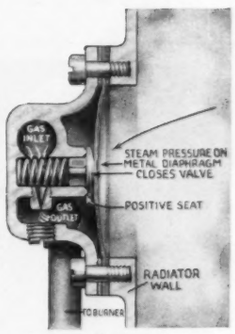


Figure A

A Correctly Designed Burner and Air Mixer Is Vitally Important

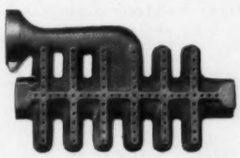


Figure B
Showing Burner used in No. 48 Radiator and indicating length of Venturi Tube used in the smaller sizes of Williams Gas Steam Radiators.

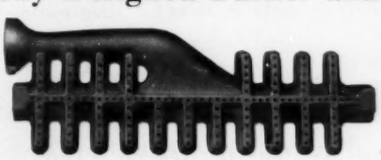


Figure C
Showing Burner used in No. 77 Radiator and indicating length of Venturi Tube used in the medium sizes of Williams Gas Steam Radiators.

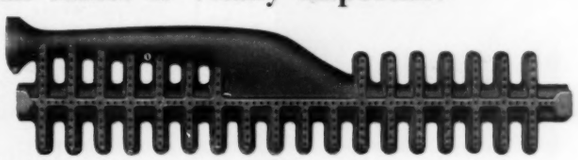


Figure D
Showing Burner used in No. 121 Radiator and indicating length of Venturi Tube used in the larger sizes of Williams Gas Steam Radiators.

To properly burn gas it is necessary that adequate and exact provision be made for primary as well as secondary air. The Venturi Tube for primary air mixture will function more efficiently when it is proportioned in diameter and length to the volume of gas and air which it is intended to pass. In our opinion it is not good practice to use only one size of Venturi Tube for all sizes of radiators. Each Williams Gas Steam Radiator is equipped with a Venturi Tube of correct size for proper operation. See above illustrations, Figs. B, C and D.

Manufactured by

WILLIAMS RADIATOR COMPANY

1865-1873 West Cordova Street **Los Angeles, California**

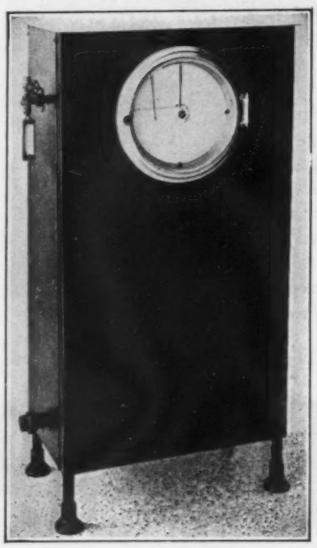
Please write or wire us regarding Eastern and Southern deliveries.

Agents wanted in several cities—An excellent opportunity for capable men

Like a Mechanical Man--- Never Tires!

AC-ME Gravitometer

This Robot works unceasingly on a 24-hour basis, inside or outside, rain or shine, hot or cold, all without overtime pay, and never complains. It gauges and records the specific gravity of natural or artificial gas continuously, and is highly accurate and sensitive to all changes of specific gravity. It also allows for temperature and barometric changes.



The GRAVITOMETER not only detects every change in specific gravity, but registers it IN WRITING. Therefore, an indispensable device where the specific gravity of gas is fluctuating, and is especially suitable when gas is secured from different sources. This apparatus is strongly built for field use; it requires but little space, and virtually no attention.

We've an interesting story to tell you about this Robot. Write for circular "W." Also ask for our bulletin "15-W," cataloging our complete line of Scientific ACcurate MEasuring (AC-ME) Equipment.

The Refinery Supply Co.

621 E. Fourth Street Tulsa, Okla.
Branch: 3404 Main St., Dallas, Tex.
Pacific Coast Representative:
The Braun Corporation
363 New High St. Los Angeles, Calif.

"Moving day" for the Los Angeles Gas and Electric Corporation's governor vault, showing the vault being taken out, preparatory to being placed in its new location.

Moving *a* 20-Ton Governor Vault

MOVING a 20-ton governor vault one-half mile to a new location was an unusual feat recently accomplished by the gas distribution department of the Los Angeles Gas and Electric Corp., Los Angeles, Calif.

The widening and lowering of Sunset Boulevard made it necessary to set the curb lines of the street back several feet, leaving a portion of the governor manhole projecting into the street and making necessary the removal of the governor pit. Shifting of loads and construction of new feeder lines since the governor had first been placed, made it advisable to move the governor to a new position where the territory could be served to better advantage.

A contract was let to a local rigging company to move the vault from Western Avenue and Sunset Boulevard to Lexington Avenue and Western Avenue, a distance of about one-half mile. The size of the project will be appreciated when it is realized that one of these vaults with its fittings weighs in the neighborhood of 40,000 pounds. A saving of several hundred dollars was marked on the credit side of the account when the operation was complete. Moving the vault cost approximately the same as the installation of a new one, but in the event of installing a new one, the old pit would have had to be destroyed and the fittings salvaged, an operation costing several hundred dollars. This saving was effected by the move.

Byllesby Accountants *in* 11*th* Annual Session

BYLLESBY Engineering and Management Corp. held its Eleventh Annual Accountants Conference at the Nicollet Hotel, Minneapolis, Minn., September 22-25, 1930. All meetings of the conference were presided over by B. F. Braheney, vice-president of the company.

Various phases and problems of utility accounting were discussed. R. F. Pack, vice-president and general manager, Northern States Power Co., spoke on the importance of the accountant to business control and operations.

The report of the merchandising accounting committee was presented by D. A. Hamilton, Byllesby Engineering and Management Corp., chairman.

P. J. Brahaney, Northern States Power Co., presented a report, outlining the items of expense entering into the purchase and warehouse clearing accounts, and made definite recommendations tending to make this procedure uniform in all of the company's properties.

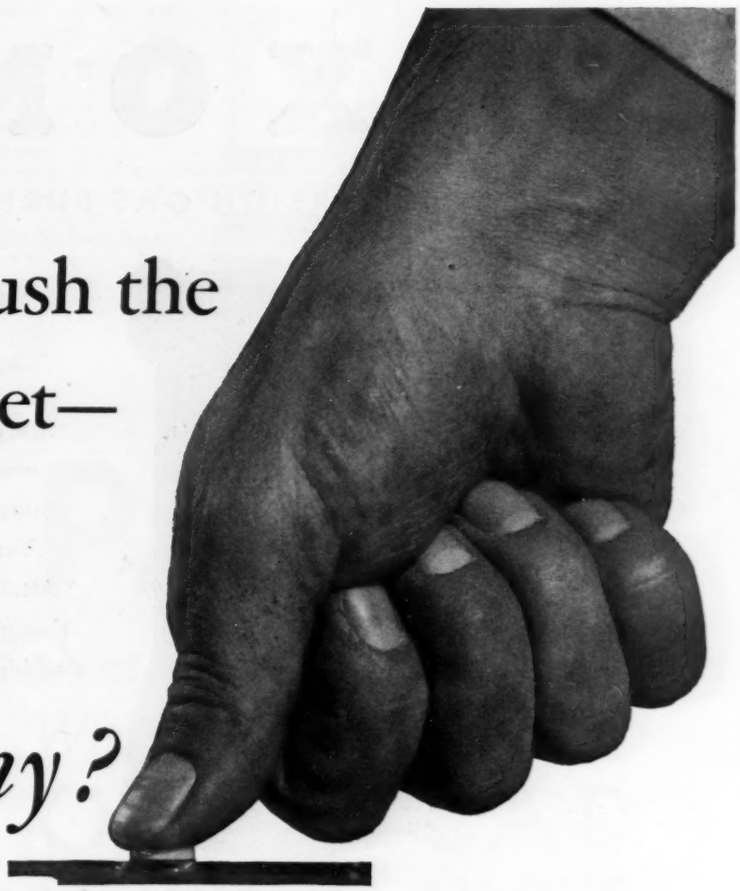
N. H. Buckstaff, Northern States Power Co., presented a paper on traveling auditor's reports.

The report of the statistical committee was presented by the chairman, L. F. Chambers.

The report on "Customers Accounting," presented by C. L. McGowan, chairman of that committee, offered numerous suggestions looking toward effecting savings in customers accounting. This committee also presented a revision of the "Meter Readers' Manual," which was adopted by the Conference.

The annual dinner of the Accountants Conference, held on September 25, was presided over by M. A. Morrison, as toastmaster. Speakers at this occasion were B. F. Brahaney, R. F. Pack, J. F. McGuire, J. J. Molyneaux, W. R. Emerson and B. W. Lynch.

When they push the button do they get—



comfort?

fuel economy?

real heating convenience?

Is "rule of thumb" the way to get the best results from gas house-heating?

Consumers who have installed *completely automatic* gas heating plants say, "No!" They say it all the more emphatically if they have once tried gas heat that was controlled manually.

One season is all a man needs to learn the facts about *automatic* control. After one season he knows without question that gas bills are kept low as possible when a uniform temperature is maintained. He knows that no human being, using any variety of manual control, can prevent the temperature from rising and falling several degrees (and wasting fuel). He knows that *automatic* heat control is the only satisfactory way to keep the temperature uniform and always comfortable. He knows what it means to have a heating plant that is truly convenient, requiring no attention except to wind the clock on the thermostat once a week.

Such a consumer is a permanent friend to the gas industry. He likes his gas heating plant. He tells his neighbors. He is an unpaid salesman, and a most convincing one, added to your sales force.

You can turn your house-heating prospects into permanently satisfied customers when you sell them gas heating plants completely equipped with Minneapolis-Honeywell automatic heat controls.

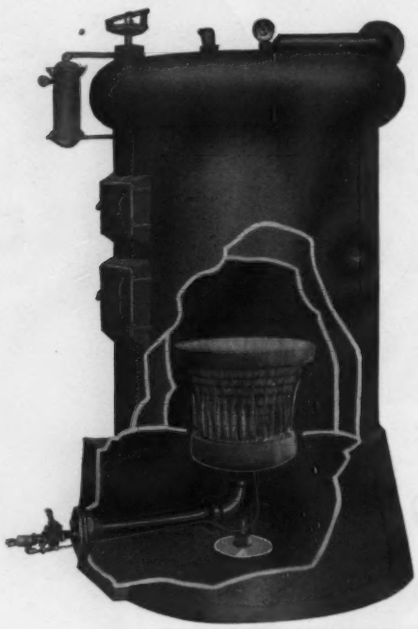
Minneapolis-Honeywell Regulator Co.

CALIFORNIA BRANCH
557 Market Street, San Francisco, California
DISTRIBUTORS
Portland, Seattle, Salt Lake City, Denver

MINNEAPOLIS HONEYWELL
HEAT REGULATOR

MAXON

DOMESTIC CONVERSION GAS BURNER



Now Available Completely Equipped with Automatic Control

Sturdy and Simple Yet Attains Complete Combustion

THE ULTIMATE IN

SIMPLICITY

Telegraph or write for prices, capacities, publicity material to

THE MAXON PREMIX BURNER COMPANY

MUNCIE, INDIANA, U. S. A.

STANDARD MANAGEMENT & OPERATING CORPORATION

225 Bush Street San Francisco, Calif.

PUBLIC UTILITY MANAGEMENT
ENGINEERING AND CONSTRUCTION
REPORTS AND APPRAISALS

The staff includes the following who have been associated with successful nation-wide public utility enterprises for several years past.

E. F. ENGLISH
E. A. OLSEN
R. N. DREIMAN
JOHN COLLINS, JR.
J. B. WILSON
A. E. HALL
CHAS. GRUNSKY

NEW ORLEANS SUPPORTS WATER HEATER SALES CAMPAIGN

A sales plan to sell all standard approved hot water heaters was inaugurated June 1, 1930, by the Water Heater Dealers, Licensed Master Plumbers, and the New Orleans Public Service Inc. The New Orleans Public Service Inc., advertises on the sales floor each month a different make of heater. Advertisements are also carried in the newspapers each month.

The total number of water heaters sold by the New Orleans Public Service Inc., since the inauguration of this plan is 291. Sales by months were as follows: June and July, 57; August, 68; September, 78; and October, 88.

GAS COMPANY TAKES PART IN "TRADE FESTIVAL WEEK"

Great Falls Gas Co., Great Falls, Mont., participated in "Trade Festival Week," held by Great Falls merchants and business firms November 10 to 15 inclusive, by offering a 10 per cent discount on all gas heaters purchased during the week and a free turkey with every gas range purchased. The latter offer held good until Thanksgiving.

Practically every business concern in Great Falls took part in Trade Festival Week, the purpose of which was to stimulate business.

CENTRAL STATES ELECTRIC CO. TO SUPPLY GREENFIELD WITH GAS

Central States Electric Co., associated with the Iowa Electric Co., Atlantic, Iowa, has applied for permission to serve Greenfield with natural gas. The latter company already holds franchises in Bridgewater, Massena, Cumberland, Adair and Grant, and several towns in southwestern Iowa, and is applying in Dexter.

LAKE PROVIDENCE BEING SERVED BY LOUSIANA POWER & LIGHT

Gas was turned into the mains of the Louisiana Gas & Fuel Co., of New Orleans, at Lake Providence, La., recently. The townspeople held a celebration at the Community Club, at which McGregor Smith, president, and A. O. Evans, division manager for the company, spoke.

NEW ENGLAND, REGENT AND MOTT N. D. TO GET "NATURAL"

A possibility that the Montana-Dakota Power Co.'s line from Glendive to Bismarck, N. D. may be extended 29 miles to the south was told recently by James Trimble, manager for the company at Bismarck. The line would serve New England, Regent and Mott, and other communities en route.

SPIRO, OKLA., NATURAL GAS LINE NOW IN SERVICE

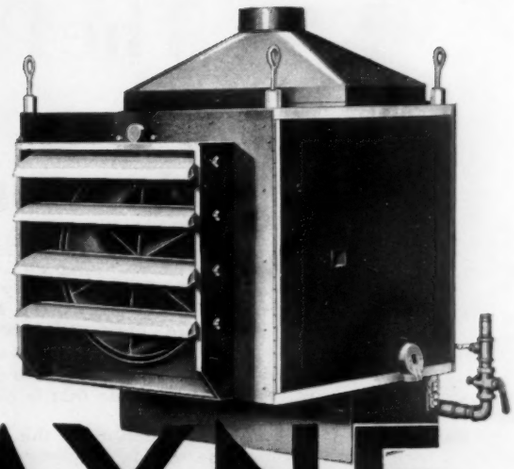
A natural gas distribution system has been completed in Spiro, Okla., as announced November 8, by the Spiro Gas Co., a subsidiary of the LeFlore County Gas & Electric Co. The latter company will secure its supply for Spiro from a line which carries gas from the Red Oak, Okla., field to Fort Smith, Ark.

WAGONER NATURAL GAS ELECTION SET FOR DECEMBER 9

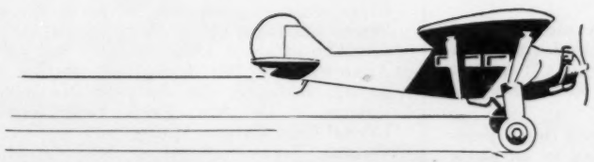
The Oklahoma Natural Gas Corp., Tulsa, Okla., has applied for a franchise to distribute natural gas in Wagoner, Okla. The election has been set for December 9.

COYLE, OKLA. FRANCHISE GRANTED TO PACT GAS COMPANY

A franchise for the service of natural gas in Coyle, Okla., has been granted to the Pact Gas Co., headquartered at Cushing.

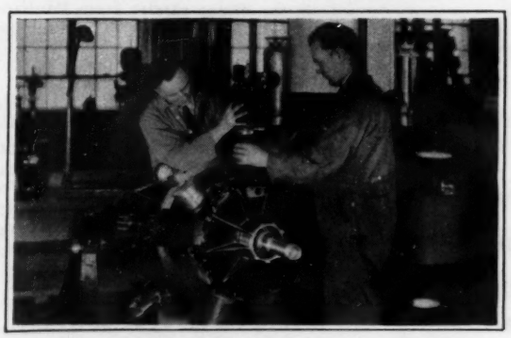


Payne Factory Unit for overhead heating of large floor areas in commercial and industrial establishments. Three sizes. Electric control. Automatic swivel hangers. Gas-fired. Vented!



Where precision of parts demands even temperature

Correctly directed heat removes the danger of dampness



Time Saving Efficiency is promoted by normal warmth

PAYNE

Solves Your Heating Problems *With...*

OVERHEAD HEATING UNITS

PAYNE OVERHEAD Heating Units are ideally adapted to hangars, shops, factories, or any enclosures where floor space is valuable and pure warm air is needed to promote efficiency. The day of the costly, elaborate and sometimes troublesome "central heating system" for factories, is no more. These Payne Factory Units for Overhead Heating... used singly or in multiple... furnish abundant fresh warm air on a moment's notice. Each unit is a complete, self-contained heating plant, equipped with an electrically driven fan system, and is individually controlled. You have in these Overhead Units the maximum in comfort and efficiency... at the lowest possible cost.

Write for Bulletin 7-C on Overhead Heat.

PAYNE ENGINEERING SERVICE

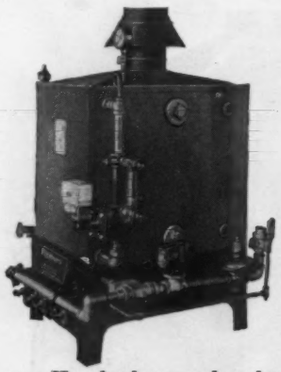
Architects, Building Contractors and Heating Engineers are invited to put their troublesome warm air heating problems up to Payne Engineers. Send floor plans and full details of heating requirements. No matter how large or how small your installation may be, the Payne Furnace & Supply Co., Inc., is ready to cooperate with you.

Payne

PAYNE FURNACE & SUPPLY CO., Inc.

Beverly Hills, California

There is a "Payne Heat" System for Every Building and Climate!



The Pittsburg A Famous Boiler

The crowning engineering achievement in the gas boiler industry has been the design and perfection of the famous "Pittsburg" Boiler, the most advanced gas-fired house-heating boiler of the day.

Hundreds upon hundreds of installations have definitely proven the superiority of the "Pittsburg," achieving a fame that is rapidly spreading to all parts of the country.

Back of the design and construction of the "Pittsburg" Boiler rests the manufacturing resources of the worlds' largest water heater manufacturers—The Pittsburg Water Heater Company.

The "Pittsburg" label on these boilers is your assurance of the highest mechanical and engineering perfection, a service organization that extends into every town and city of any importance in the land, and an iron-bound guarantee of proven dependability.

Just as "Pittsburg" Water Heaters have demonstrated their superiority, so you will find "Pittsburg" Boilers rendering unsurpassed service wherever installed.

Write for booklet, prices and discounts.

"Efficient House Heating With Gas."
"Pittsburg House Heating Boilers."

Pittsburg Water Heater Company
Factory and General Office: Pittsburgh, Pa.
Offices in all principal cities.

Fire Brick

Should always be the best quality obtainable for the purpose . . .

That is our specialty, and we invite your inquiries. . .

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Where modern scientific planning and management make possible rates surprisingly moderate. 1400 Rooms, each with bath and shower.

$3-5 For One $4-7 For Two

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Times Square · NEW YORK

APPALACHIAN BUYS STOCK OF TEXAS GAS UTILITIES CO.

Appalachian Gas Corp. announces the acquisition of the remaining 25 per cent of outstanding common stock of Texas Gas Utilities Co., headquartered at Del Rio, Texas, making it a wholly owned subsidiary. The acquisition was effected through the exchange of stock.

Texas Gas Utilities Co. produces natural gas in the west Texas field, distributing it in Val Verde, Dimmick, Maverick and Zavalla counties. Its largest customer is the Devil's River electric generating plant of Central Power and Light Co., with an estimated consumption of about 5,000,000 cubic feet daily. Approximately 200 miles of pipe line are owned, including the domestic distribution systems in Del Rio, Eagle Pass, Uvalde, Crystal City, Carizzo Springs and the Winter Garden, Texas.

IOWA RAILWAY & LIGHT COMPANY INSTALLS TWO SYSTEMS

Iowa Railway and Light Co., Cedar Rapids, has completed distribution systems in Walthill and Lyons, Neb. A. J. Lawler, construction superintendent, had charge of the work. The company has recently secured natural gas franchises in Walthill, Lyons, and Blair, Neb., and holds franchises in Missouri Valley and Clarinda, Iowa, the last two now being operated with butane gas.

E. C. Guyney has been transferred from Creston, Iowa, to take charge of the merchandise sales at Lyons, Neb.

SHELL NITROGEN PLANT TO USE 6,000,000 C. F. FROM STANPAC

The new nitrogen plant of the Shell Company near Pittsburgh, Calif., plans to use about 6,000,000 cubic feet of natural gas a day from the Standard Pacific pipe line in extracting hydrogen, which the company will use to fix nitrogen from the air, planning a total daily capacity of about 60 tons of ammonia. This will be converted into nitric acid or ammonium sulphate and marketed.

CENTRAL STATES UTILITIES CO. ASKS WHITEWATER PERMIT

Central States Gas Utilities Co., a subsidiary of Missouri-Kansas Pipe Line Co., headquartered at Kansas City, Mo., has applied for a franchise for the service of natural gas in Whitewater, Kan. Supply would come from the major carrier from Panhandle and Stephens County fields, to Indianapolis, now under construction.

ESCALON, CALIF., WANTS NATURAL GAS SERVICE FROM P. G. AND E.

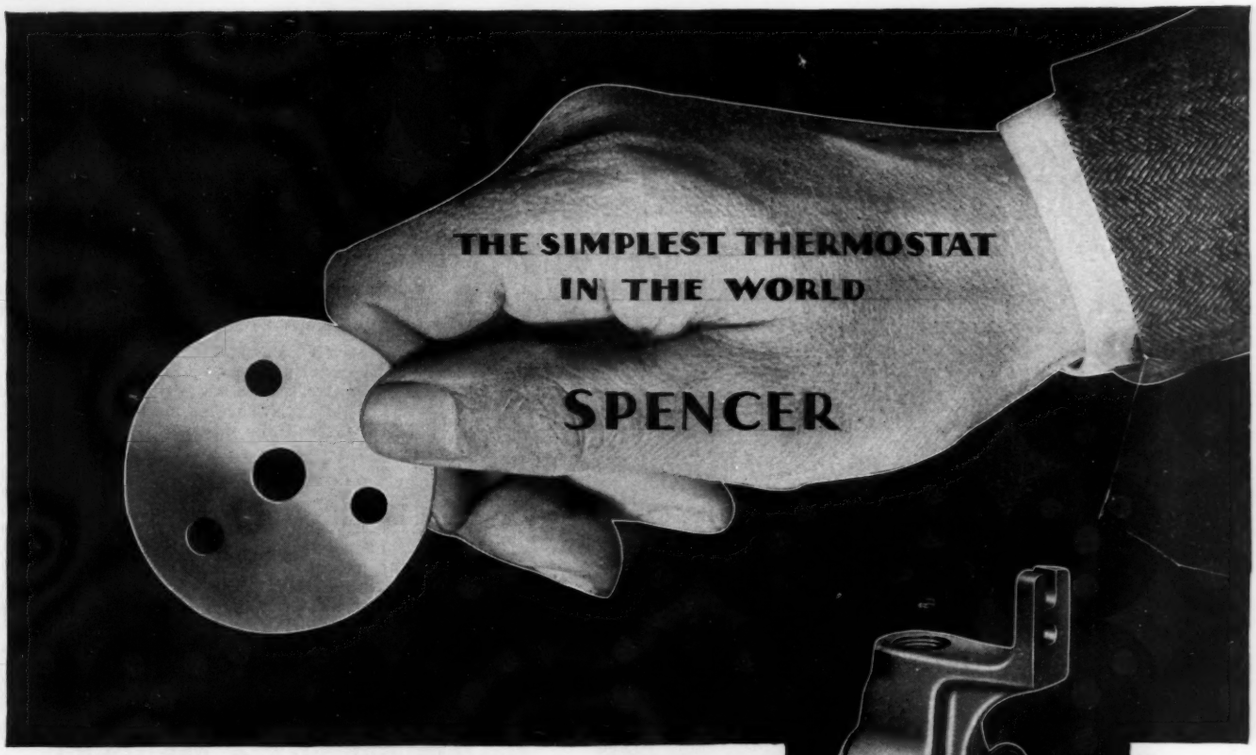
Escalon, in the Oakdale district of central California, may have gas from the mains of the Pacific Gas and Electric Co., San Francisco, when enough signatures can be secured to a petition asking the company to bring a line into the town.

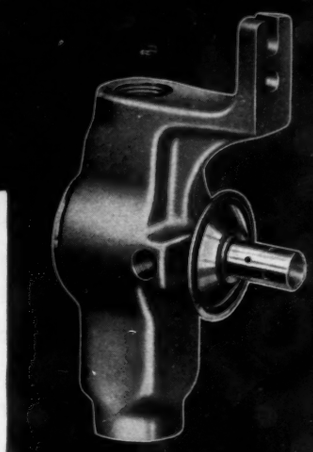
NEWMAN GETS GAS SERVICE ON NOV. 6 FROM P. G. AND E.

Natural gas was turned into the city's mains at Newman, Calif., on November 6, the formal opening being under the direction of H. P. Heryford, district manager for the Pacific Gas and Electric Co., of San Francisco, franchise holder.

EASTERN COLORADO GAS CO. ASKS LONGMONT FRANCHISE

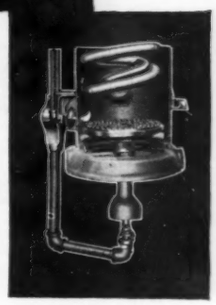
Eastern Colorado Gas Co., is applying for a franchise for the service of natural gas in Longmont, Colo.





KLIXON SAFETY PILOTS

FOR . . . . . AUTOMATIC STORAGE WATER HEATERS



KLIXON Products have the exclusive use of the patented Spencer Snap-Acting Thermostatic Disc shown above. This simple bi-metallic, concave disc is a complete thermostat in itself, snapping from concave to convex and vice-versa at a predetermined temperature. It furnishes its own motive power and acts with a powerful, positive thrust, without the use of mechanical advantages of any kind. As applied to this Klixon safety pilot for circulating tank heaters it shuts off the main gas supply positively if the pilot flame is extinguished for any reason. This safety pilot has been thoroughly tested in use, and is used as standard equipment by some of the largest manufacturers of circulating tank heaters. In its simplicity there is safety, economy, and freedom from trouble.

May we send a complete descriptive folder?

SPENCER THERMOSTAT CO

CAMBRIDGE · · · MASS

Pacific Coast Representative, B. W. MUELLER, 447 Sutter St., San Francisco, California

"It is understood and agreed that time is the essence of this contract"

This is the closing clause of most every pipe line contract executed.

Pipe can be joined more quickly and satisfactorily with "VICTAULIC" couplings and fittings than by any other method, . . . and when it is, every joint is permanent, flexible and leakproof.

For Western deliveries large stocks are maintained by

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DISTRIBUTORS

LOS ANGELES **SAN FRANCISCO**

The BARTLETT HAYWARD CO.

Designers and Builders

GAS HOLDERS

COMPLETE COAL GAS, CARBURETTED WATER AND BY-PRODUCT PLANTS

SALT WATER and FRESH WATER CONDENSERS

PURIFIERS, STEEL TANKS, FELD VERTICAL SCRUBBERS

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NORTHERN STATES UTILITIES TO EXTEND LINE TO LEWISTOWN

Plans of the Northern States Utilities Co., for extending its Great Falls line to Lewistown, in central Montana, have been announced by A. A. Nicas, director of the Range Oil & Gas Co. This company now controls the Rogers-Imperial gas well 6 miles north of the Canadian border and has obtained an annually-renewable license for exporting gas from Canada into the United States. Pipe is now being laid to connect this well with the northern terminal of the line through which the Northern States Utilities Co. is now serving Great Falls, 120 miles to the south.

Mr. Nicas stated that gas from the Rogers-Imperial would shortly be serving not only Great Falls but also Lewistown, indicating that plans are under way for extending the Great Falls line.

PACIFIC GAS AND ELECTRIC CO. REPORTS NET GAIN OF $240,951

An increase of $240,951 in net earnings of Pacific Gas and Electric Co., San Francisco, is reported for the nine months ended September 30. These earnings include operations of Great Western Power, San Joaquin Light and Power and Midland Counties Public Service from June 12, last, when these properties were acquired.

Gross income, including other income, aggregated $56,346,113 during the period, which is $7,640,534 over the corresponding months of last year.

ARIZONA EDISON PLACES ISSUE OF $1,500,000 ON THE MARKET

An issue of $1,500,000 one-year gold notes has been offered by the Arizona Edison Co., Phoenix, Ariz., for additions and betterments to the system.

For the 12 months ended September 30, last, gross earnings were $1,904,723.46, as against $1,804,162.85 for the preceding 12 months.

About 16 per cent of the company's income is derived from its gas properties.

AURORA, COLO., TO GET SERVICE FROM LINE TO FITZSIMMONS

Aurora, Colo., on the eastern outskirts of Denver, has granted the Public Service Company of Colorado of Denver a 20-year franchise to supply the community with natural gas. Present plans call for the building of a distribution system next spring, to tie in with the extension built from the Denver intake gate to Fitzsimmons General Hospital, adjacent to Aurora.

LUSK, WYOMING TO GET SUPPLY FROM LANCE CREEK FIELD

A 25-year franchise for the service of natural gas in Lusk, Wyo., has been granted to C. Frank Bautch and associates. The supply will be obtained from the Lance Creek field, from which a 4-inch line will be constructed.

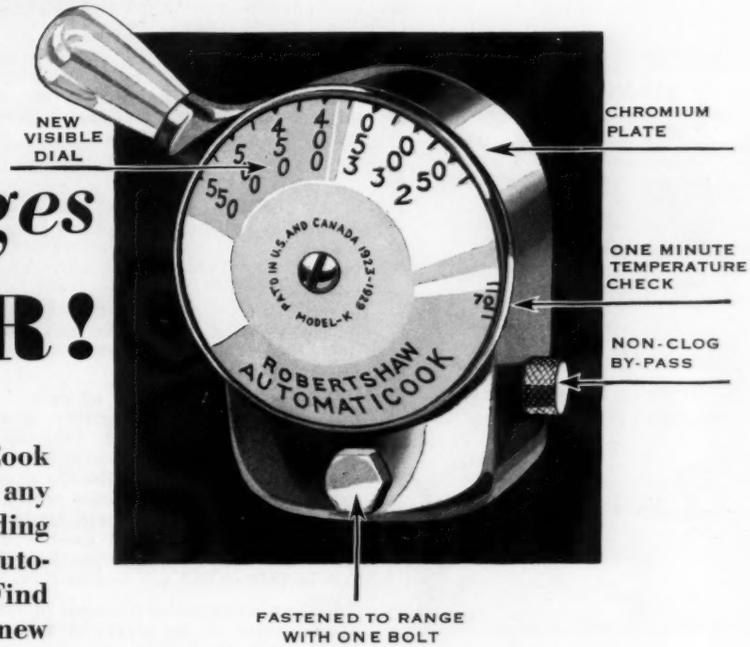
RANGE SALE SUCCESSFUL FOR LOUISIANA POWER & LIGHT CO.

Louisiana Power & Light Co., New Orleans, La., recently carried on a campaign for the sale of gas ranges in the Algiers and Metairie districts, selling 122 ranges in two weeks time.

ROSEDALE SECTION ADDED TO EL PASO NATURAL SYSTEM

El Paso Natural Gas Co., El Paso, Texas, recently extended its lines to serve Rosedale addition in the lower valley east of El Paso.

The NEW "K" *Type* AutomatiCook *is selling Gas Ranges* FASTER!



THE new "K" Type AutomatiCook is a definite selling point on any range. And more than 100 leading makes of gas ranges will be AutomatiCook equipped this year. Find out the selling arguments of the new AutomatiCook—*now!*

It's smaller, more compact, better looking. Chromium plated. A full vision dial. An absolutely foolproof One-Minute Temperature Check. A non-clog by-pass. Only *one* bolt secures the AutomatiCook to the range. The AutomatiCook is so designed that temperature setting, calibrating and all working parts are accessible from outside the range.

Study up on the new AutomatiCook, now. Write for our descriptive literature. We'll be glad to send this literature to your salesmen and service men, too. Just send us their names. But write *now*—if you want to make selling of gas ranges easier this year!

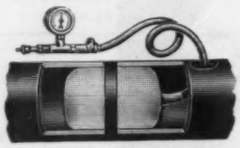
ROBERTSHAW
AutomatiCook

ROBERTSHAW THERMOSTAT COMPANY
Youngwood, Penna.

THE
GOODMAN
STOPPER

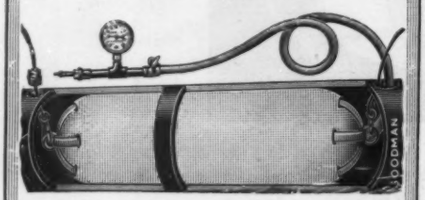
WHEN LOCKED IN PLACE IT HOLDS

DEPENDABLE GAS
MAIN BAGS



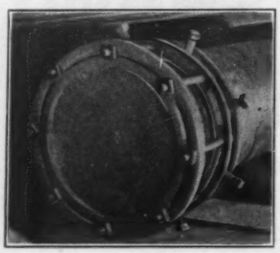
Type C

GOODMAN CYLINDRICAL
STOPPER FOR INTER-
MEDIATE PRESSURE



Increased Length for Increased Pressure

KRUPA-HENDRY
TEST CAP



For Testing High Pressure Lines

SHIPMENTS FROM STOCK

SAFETY GAS MAIN
STOPPER COMPANY

523 Atlantic Avenue
BROOKLYN, N. Y.

Pac. Coast Rep.: C. B. Babcock Co.
135 Bluxome Street, San Francisco
California

Natural Gasoline Gains *in* 1929

THE natural-gasoline industry, noted for its rapid growth, again established a new record for output in 1929, when a total of 2,233,688,000 gallons was produced, according to statistics compiled by G. R. Hopkins of the United States Bureau of Mines, Department of Commerce. This output represents an increase of 23 per cent over 1928, as compared with an increase of 11 per cent in 1928 over 1927 and an annual increase for the past 10 years of 21 per cent.

There was a pronounced tendency to erect larger plants and, while the recovery per thousand cubic feet of gas treated was below the average, the large quantity of gas put through the plants had a material effect on the total output for the year.

Another stimulating factor in natural gasoline production in 1929 was the rapid growth in the utilization of natural gas. The year marked the completion of several large interstate pipe lines and the number of natural gas consumers gained materially. The total consumption increased 22 per cent and, since practically all of the gas piped is treated for natural gasoline before it is turned into the lines, the production of the latter increased proportionately.

Refiners, the chief users of natural gasoline, utilized 1,851,360,000 gallons of natural gasoline in blends in 1929. This represents an increase of 32 per cent over 1928. This material increase in the utilization of natural gasoline in 1929, in conjunction with a much smaller gain in gasoline output (15 per cent) raised the ratio of natural gasoline utilized to the total gasoline production from 9.3 per cent in 1928 to 10.7 per cent in 1929.

The natural gasoline produced in 1929 had a total value at the plants of $158,410,000 which, while the highest total ever recorded, represents an average value per gallon of only 7.1 cents, the lowest ever recorded.

Production in California in 1929 amounted to 840,325,000 gallons, an increase over 1928 of 44 per cent. By virtue of this material gain, that State became for the first time the leading producing State. Both Oklahoma and Texas, which rank second and third, respectively, reported gains in output in 1929 and, with California, produced 87 per cent of the total output.

The industry improved its economic position in 1929 by increasing the production of stabilized natural gasoline and through the development of by-products. These two go hand in hand because the principal by-product is liquefied gas, or propane and butane removed from the raw natural gasoline in the process of stabilization. Stabilizing yields three main benefits to the manufacturer, namely, a more uniform product, a natural gasoline that has superior handling qualities and can be shipped in bulk, a by-product, liquefied petroleum gas, which is rapidly becoming a very important source of revenue.

On January 1, 1930, there were 1,035 natural-gasoline plants in the United States, with a total daily capacity of 10,516,000 gallons. The last similar survey, that of January 1, 1928, showed a total of 1,155 plants of 8,048,000 gallons daily capacity. Thus in two years' time the number of plants has decreased by 120, but the total capacity has increased 2,468,000 gallons, or 31 per cent. This is roughly equivalent to the gain in production over the same period.

During 1929 the average total daily capacity of the plants was 9,899,000 gallons, while the average daily production amounted to 6,015,000 gallons. This indicates that the plants operated during 1929 at 61 per cent of their capacity.

RESTAURANT RANGES CHANGED TO NATURAL GIVE BETTER SERVICE

Among interesting applications of natural gas for commercial and industrial use in the Santa Cruz territory of the Coast Counties Gas and Electric Co. following the advent of natural gas from Kettleman Hills fields, was the conversion of two coal-fired restaurant ranges to gas. The California Restaurant in the Watsonville district of the company has for many years been using a large coal fired range which the owners did not feel they could afford to replace, although recognizing the benefits to arise from the use of the new fuel.

The industrial department of the company advised a conversion job, installing two kiln-type burners, and in addition to making possible the use of gas in the range, it has made available a third oven for baking, has cut down the time necessary for roasting by two to three hours, and has made it possible to adapt the 4-foot by 12-foot top for any kind of frying or cooking. The saving of storage space and eliminating the necessity for removing ashes are other attractive features of the installation.

A similar conversion job is being completed for the New States Grill of Watsonville, as reported by W. N. Thayer, industrial gas engineer for the company.

PUBLIC SERVICE CO. OF COLO. ASKS FRANCHISE AT ALAMOSA

Public Service Company of Colorado, Denver, has applied for a butane and natural gas franchise at Alamosa, Colo. If this franchise is granted the San Luis valley town will be the first in Colorado to receive liquefied natural gas by means of a central distribution system. Alamosa is so far from the Amarillo-Denver natural gas line that an extension is not practical, but such active exploration work is being prosecuted throughout Colorado that a local gas field may be developed; this possibility is anticipated in the franchise.

WEST COAST GAS AND FUEL ASKS ANGELS CAMP PERMIT

West Coast Gas and Fuel Co., of San Francisco, Calif., has applied to the State Railroad Commission for permission to construct a liquefied natural gas distributing plant at Angels Camp, Calif.

C. O. MOORE INTERESTS ASK TO SERVE NORTH BATTLEFORD

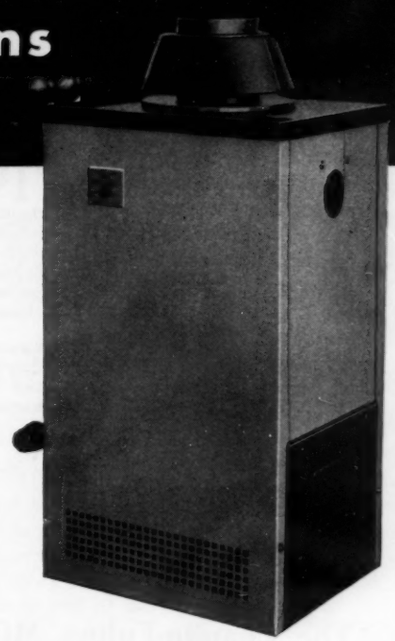
The C. O. Moore interests, through the legal firm of Estey, Moxom, Schmidt and McDonald, of Saskatoon, Sask., have applied to the town of North Battleford for permission to serve gas in that town.

PUBLIC SERVICE CORP. GETS PERMIT AT CHAPPELL, NEBRASKA

The Public Service Corp. of Nebraska has been granted a natural gas franchise at Chappell, Neb.

Announcing

the new
IDEAL ARCOLA GAS BOILERS
For smaller installations

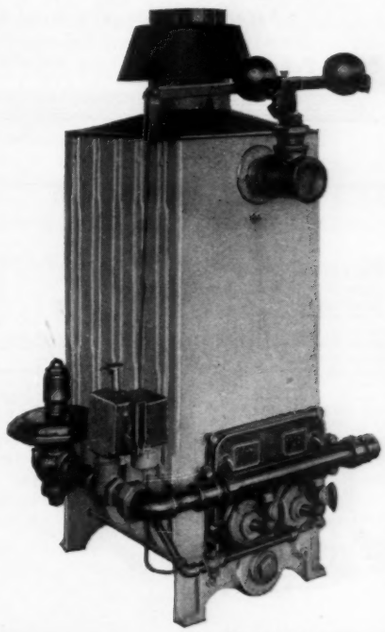


Jacketed

Now there is an Ideal Gas Boiler for every size installation. The New Ideal Arcola Gas Boilers can be economically installed in even the smallest homes, apartments, lofts and stores, and connected to American Radiators, give the same efficient heating that the larger boilers give to larger buildings.

The small size of the boiler and the low price open up new markets which for the first time can now be supplied—by the new 1-GA and 2-GA Ideal Arcola Gas Boilers alone. And they have another advantage. They are especially suited for furnishing hot water for homes and larger buildings.

Without jacket they are a unique combination of heating boiler, hot water supply boiler and radiator. Write us for details.



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For *Speed Pump* Regulation use this CF Compressor Regulator

NECESSARY relief of excess discharge pressure is made sure and safe for the compressor operated at constant speed. . . . On low pressure gas compressors, constant discharge is held without affecting pressure of supply main, regardless of differential between main and discharge pressures . . . . Equally successful for steam as a back-pressure regulator . . . Only means for close regulation of uniform pressure on electric driven pumps . . . Applicable for gas, air, steam and water.

THE valve has a definite positive movement for a definite change in discharge pressure, and will remain indefinitely at some intermediate position between the wide open and closed position.

Excess discharge pressure flows through this regulator **without noticeable variation.**

Write for data pamphlet.

The Chaplin-Fulton Mfg. Company

Manufacturers of Regulators for All Natural and Manufactured Gas Services

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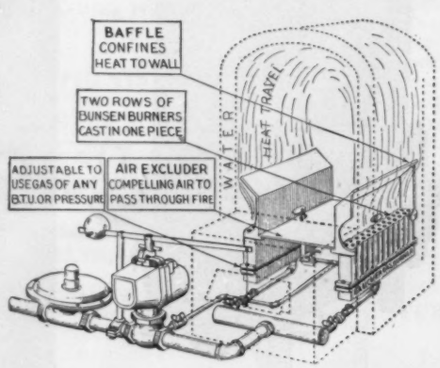
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TWO ROWS OF BUNSEN BURNERS CAST IN ONE PIECE
ADJUSTABLE TO USE GAS OF ANY B.T.U. OR PRESSURE
AIR EXCLUDER COMPELLING AIR TO PASS THROUGH FIRE
WATER
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Perfect combustion correctly applied insures maximum efficiency

Noiseless, Sootless Ideal for Cast Iron Boilers

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SITUATIONS WANTED—MALE

Gas heating engineer desires connection in middle west. Applicant is 32 years old and has had a technical education. He has had over 12 years experience as heating and ventilating engineer and is familiar with design, combustion, sales, installation, and service of all types of gas boilers, furnaces, space heaters, conversion equipment, and control equipment. Address Box B-107, *Western Gas*, 124 West Fourth Street, Los Angeles, Calif.

J. C. AXELSON MFG. CO. EXECUTIVES ON EXTENDED EASTERN TRIP

Leaving Los Angeles November 4, J. C. Axelson, president of the J. C. Axelson Manufacturing Co., Ltd., and L. F. Merrill, chief engineer of the same organization, began an extended tour of the mid-continent and eastern oil fields. They planned to make a detailed study of operating and business conditions throughout the eastern area over a period of approximately a month. While in the east Mr. Axelson and Mr. Merrill represented their company at the annual meeting of the American Petroleum Institute which was held at Chicago recently.

NEW WELL TO AUGMENT UNITED GAS COMPANY SUPPLY

A discovery well was brought in eight miles east of Rio Grande City, Texas, near the United Gas Co. line to Monterrey, Mexico. The gas supply will be used in that line, as well as to augment the supply to Houston, and other cities on the company's mains.

NEWCOMBE GAS CO. TO SERVE IN INDIANOLA, OKLA.

The Newcombe Gas Co., of Checotah, Okla., has been granted a franchise for natural gas service in Indianola, Okla. The company already serves Crowder and Canadian.

DIXIE GAS AND FUEL APPLIES FOR CLEVELAND, TEXAS, PERMIT

The Dixie Gas and Fuel Company of Houston, Texas, a United subsidiary, has applied to the city of Cleveland, Tex., for a franchise to serve natural gas in that locale.

MARFA, TEXAS, FRANCHISE GOES TO A. T. WOODS INTERESTS

A. T. Woods of San Antonio, Texas, has been granted a franchise at Marfa for installation of gas mains and laterals. It is proposed to construct a natural gas transmission line from Fort Stockton to Marfa.

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NATURAL GAS ENGINEERS
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The Leahy Multi-Jet Gas Burner, due to rapid ignition and low draft requirements makes possible a high rating with maximum efficiency. The Leahy Oil Burner will thoroughly atomize any grade of fuel oil with a minimum amount of steam or air.

◆

Leahy Dual Combustion Equipment, embodying both oil and gas burners in one unit, represents the highest development in industrial heating engineering. In these Leahy units one fuel can be replaced with the other without loss of time or change in efficiency.

Insure continuous operation with the protection Leahy Dual Combustion Equipment provides. For full particulars mail the attached coupon.

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Established 1902
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LEAHY MANUFACTURING CO.,
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Gentlemen:
Kindly send me full information concerning Leahy Dual Combustion equipment.

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Address .....

WEBSTER
Radiant Gas Burners

Quality and Service with Speed

San Francisco's water supply depends on Webster Radiant Gas Burners!

At the Spring Valley Water Co., Redwood, California, Webster Burners provide the steam that forces millions of gallons of pure water into the San Francisco water system.

Mr. C. A. Bohanan, formerly Industrial Salesman of the Pacific Gas and Electric Company, was responsible for this outstanding Webster installation.

This is a burner job that demands high qualifications . . . . **dependability** . . . **quick service** . . . **high boiler efficiency** . . . **economical fuel consumption.** Webster equipment was selected because it met every performance requirement.

Just one of hundreds of Webster installations that are giving typical Webster satisfaction under unusually difficult conditions. Write us about **your** boiler problems. Webster engineers will be glad to assist you.

The Webster Engineering Co.
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Boiler Burner Division of
The Surface Combustion Co.
Subsidiary of Henry L. Doherty & Co.
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Branch Offices in All Principal Cities
Member of Industrial Furnace Manufacturers Association

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Bartlett Hayward Co.
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BALTIMORE NEW YORK

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OF
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SALT WATER AND FRESH WATER CONDENSERS

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SHAVING SCRUBBERS

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STEEL TANKS

VERTICAL WASTE HEAT BOILERS

GAS HOLDERS

...and don't overlook McWANE PIPE

It will resist rust, because it's **cast iron.** It will hold gas at high pressures because it affords a choice of high-pressure joints: McWane recess-threaded (without couplings) or Flexpan.

And the deliveries will be prompt because it is western-made, for prompt all-rail shipments from foundries at Provo, Utah.

No Ordinary Pipe!

McWane-Pacific is no ordinary cast iron pipe. While it is sand cast, it is modern in weights and strengths. Made of close-grained gray iron combining unusual tensile and transverse strengths with a resiliency that causes it to bend before it will break.

It is rapidly making its way into the natural and high-pressure gas fields for mains and services.

At least find out who is using it—and why. It will pay you, too.

Very Small Sizes, Too

Only McWane-Pacific makes cast iron pipe as small as 1¼ inches. And world's largest makers of 2 and 3 inch sizes cast iron pipe. Get new small cast iron pipe booklet for latest facts.

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Build Goodwill and a Profitable Load....

"The keystone of success of any public utility is proper public relations, . . . while the balance sheet may not list among its capital accounts "goodwill", its possession is regarded as a valuable asset to any company," said R. E. Haas, Director of Public Relations, Columbia Gas and Electric Corporation, at the New Orleans Natural Gas Convention.

Because goodwill is more important than additional load, many utilities once thought it unwise to push the sale of conversion burners. They were regarded as inefficient, makeshift means of heating with gas.

But Janitrol has helped to change this impression.

Janitrol is not merely a conversion burner. It is a carefully designed unit which includes all the safety and automatic features found on gas designed boilers and furnaces. It has been approved by the Underwriters Laboratories—indorsed by one hundred and eighty gas companies—accepted by 25,000 home owners. It is now recognized as a dependable means of converting almost any boiler or furnace to an automatic gas burning system.

A well known southern utility organized a house heating department early in 1929. That year it installed 1510 Janitrols—added $181,200.00 to its income by increasing its domestic meter load 156,700,000 cubic feet.

Another public utility has, in the past three years, sold gas heating service to one home out of every seven, installed over 6,000 Surface Combustion home heating units and removed less than 2 per cent.

These and hundreds of other companies are not only building greater loads and profits but are also increasing their GOODWILL.

You may be interested in knowing how this is being accomplished. If so, our representative will gladly give you the facts or we will mail you detailed reports.

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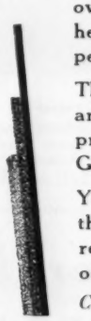

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Subsidiary of Henry L. Doherty & Co.
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NEW IVORY AND BLACK OR GREEN AND IVORY PORCELAIN FINISH

New Cast Front.

Porcelain Cooking Top—stain-proof and rust-proof.

One-piece Oven Doors and Concealed Door Hinges and Bolts.

Large roomy oven.

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James Graham Manufacturing Company

Largest Stove Manufacturers in the West

Domestic and Restaurant Gas Ranges

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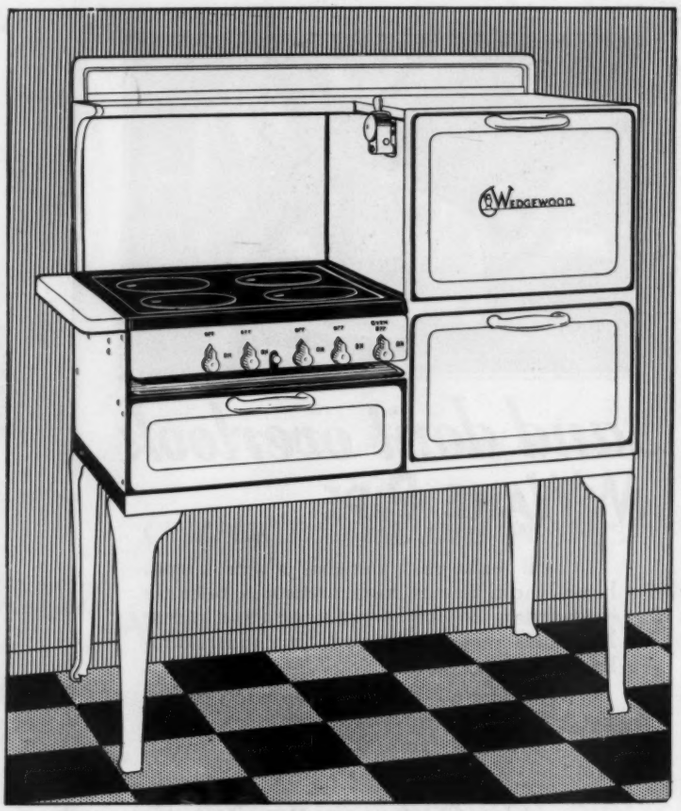

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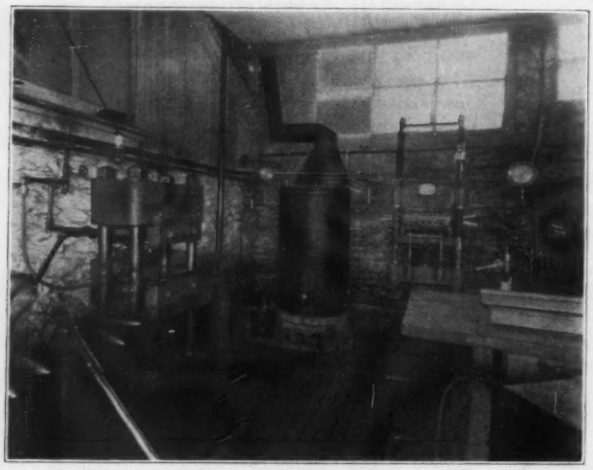

Kane Boilers Supplying Steam for Bakelite Presses

8-hp. KANE Gas Boiler supplying steam for heating Bakelite presses. This boiler was especially built for the extra high steam pressure necessary to give the heat required for Bakelite molding.

KANE

Gas-Fired Boilers

Cultivate Your Extensive Market

For Gas-fired Boilers

Almost every branch of industry, from the bake-shop to the printing plant, uses process steam in production. In cases where by-product steam is used, there is usually room for improvement, because an independent gas-fired steam source is universally admitted to be the best method there is for generating **process steam.**

KANE BOILERS meet the demands of this extensive market. Being compact, they offer no problem of installation, and they eliminate the need for long pipe lines. Being automatic, they are fool-proof and highly efficient, delivering abundant clean steam at fixed pressures and temperatures. Furthermore, Kane boilers require no labor of firing—no ash or fuel handling, and they are always ready. **Cultivate your extensive market for gas-fired boilers,—with KANES. Write for Bulletins.**

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Makers of Automatic Gas Boilers for over a Quarter Century

Retail Price $38.50
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SPARK

(Patented; other Patents Pending)

CIRCULATING Gas HEATER!

Mail It Today!

NEVER has a gas heater had such marked success so early in the year . . . and **now**, with the season advancing to its peak—**NOW** is the time to push the SPARK vigorously.

This handsome home heater offers every buying inducement—plenty of merchandising opportunity. Beautiful as a radio, with its attractive two-tone grained walnut finish. Entirely **new** design (patented and others pending) provides far superior performance. It is small, compact; efficient, durable. Specially designed to use any gas.

TEST IN YOUR OWN LABORATORY AT OUR EXPENSE

Hammer-Bray Co.,
Oakland, California

Ship, charges prepaid, sample model 602 Circulating Gas Heater with privilege of returning, with no obligation to us.

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Sprague Semi-Chrome Leather

Resists Acids and Boiling Water

Now Used in All

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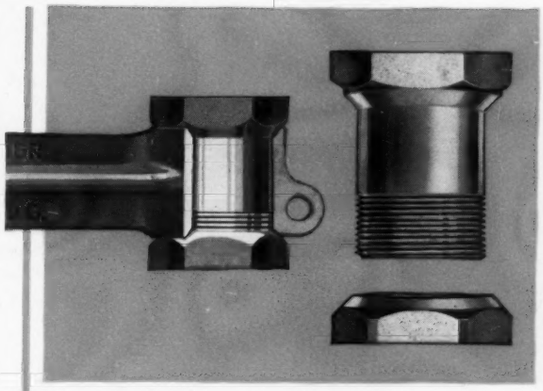


An enlarged and cutaway view showing the adjustable bevel cylinder principle.

G-11214 End inlet, Vertical adjustable cylinder outlet.

	Inlet	Outlet	Swivel Tapping
5 light	¾"	¾"	½"
10 light	1 "	1 "	¾"

G-11237 Vertical adjustable cylinder inlet and elbow type cylinder outlet.

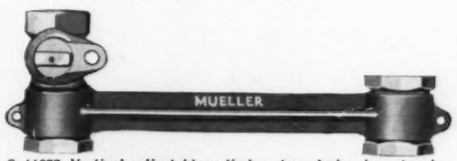
	Inlet	Outlet	Swivel Tapping
5 light	¾"	¾"	½"
5 light	1 "	1 "	½"
5 light	1 "	1 "	¾"
10 light	1 "	1 "	¾"

G-11239 Vertical adjustable cylinder inlet and outlet.

	Inlet	Outlet	Swivel Tapping
5 light	¾"	¾"	½"
5 light	1 "	1 "	½"
5 light	1 "	1 "	¾"
10 light	1 "	1 "	¾"
20 light	1¼"	1¼"	1 "
30 light	1½"	1½"	1¼"

G-11254 End inlet with lock wing stop; Vertical adjustable cylinder outlet.

	Inlet	Outlet	Swivel Tapping
5 light	¾"	¾"	½"
10 light	1 "	1 "	¾"



G-11277 Vertical adjustable cylinder, type lock wing stop inlet, vertical cylinder outlet.

	Inlet	Outlet	Swivel Tapping
5 light	¾"	¾"	½"
5 light	1 "	1 "	½"
10 light	1 "	1 "	¾"

Mueller Meter Hangers furnished with shelf and rods when specified.

Now a
NEW Mueller
adjustable
Cylinder Meter Hangar

No union joints . . .
Fewer connections . . .
Other exclusive features

Never before has the gas trade been offered the new bevel cylinder principle upon which the new Adjustable Mueller Cylinder Meter Hanger is constructed. This outstanding improvement operates on the swivel principle and provides ample adjustment for connecting offset swivels to meter without placing the usual strain on meter tube screws.

The bevel on the cylinder and lock nut fit into a bevel recess and when tightened up make a rigid meter hanger that protects the meter from strains due to shifting of pipes and vibration.

Gas Companies are invited to write for full information of this new Mueller product which represents such a substantial development in Meter Hanger construction.

Write for the complete catalog of Mueller gas service goods

MUELLER COMPANY (Established 1857). San Francisco: 1072-76 Howard Street; Los Angeles: 2468 Hunter Street; Dallas: 901 McKinney Avenue; Atlanta: 376 Nelson Street, S. W. *Factory:* Decatur, Illinois. *Canadian Factory:* MUELLER, Limited, Sarnia.

MUELLER

ONE PIECE BODY CASTINGS

AVOID EXTERNAL LEAKS AND SEEPAGE

EMCO large capacity positive meters have 15 years' successful performance behind them. Eminent gas engineers have voluntarily shown us results of independent tests in which the EMCOS, with 10,000 cu. ft. per hour capacity, have accurately measured down to 10 cu. ft. per hour.

Design of EMCO body castings assures freedom from leaks and is inherently stronger than any body requiring side plates held in place by bolts. Our design requires only one-third as many bolts or cap screws, which reduces labor, and eliminates gasket trouble. It avoids seepage troubles when used with manufactured gas.

The body design is exclusive with us. And so is the valve plate, which makes it possible to put an EMCO in a pit or against a wall, and still have all internal parts accessible. Repairs or inspection can be made without removing the meter body from the line, which is impossible with competing meters. There are more EMCO Large Capacity positive meters in use than all other makes combined. They are built in the largest gas meter factory in the world.

10 reasons why EMCOS are better

1. Past Performance.
2. Engineering Design.
3. Free from leaks.
4. 66% less bolts and cap screws.
5. Reduces labor.
6. Eliminates gasket troubles.
7. Avoids seepage.
8. Accessible.
9. Repair or inspection made with meter in line.
10. There are more EMCO Large Capacity Positive Meters in use than all other makes combined.

PITTSBURGH EQUITABLE METER COMPANY

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